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ABSTRACT

The purpose of this interdisciplinary instructional design is three-fold. At its basic level it serves as an activity-based program guide for developing in students and instructors, grades 4-12, the ability to observe, assimilate and interpret the world around them. On another level it provides the "hands-on" experiences that open the bounds of the usual four-walled classroom and allows the student and instructor to develop a learning motif that is limited only by their imaginations. Finally, at its most creative level, the design is structured to acquaint student and instructor with the principles of values and decision-making. Through a multi-disciplined approach, the design attempts to engage student and instructor in the complex problems of priorities and personal world. Confidence and curiosity should be magnified through this exercise, exciting student and instructor to step beyond the limits of their present knowledge. Each investigation contains suggestions for setting the stage, a series of tasks to be done individually or in small groups, task card samples to be used with these activities, summary activities and questions, supplementary charts and tables where appropriate, and in some instances, additional information about the type of teaching activity to be used. Collecting data from primary sources and group problem solving are used throughout the material. (RH)

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WHOLE EARTH DESIGN

Indiana Department of Public Instruction — Indiana State Board of Health

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1976

Foreword

Environmental problems have reached a crisis proportion in some Indiana communities. Water pollution, air pollution, noise, visual blight, solid waste, destruction of wildlife habitats and the loss of valuable farm land to shopping centers and housing projects are just a few of the issues and problems facing the citizens of this state and nation.

The task of halting the destruction and depletion of our resources and the preservation of human and animal health will be accomplished by many students, parents and adults getting involved in community, state and national environmental projects. This *Whole Earth Design* contains investigations which suggest ways students and educators can become directly involved in activities to study and improve natural and human systems. It is an action-oriented design which asks participants to stop, look, think, analyze and pursue process activities to improve their local environs.

The Indiana Department of Public Instruction, the U.S. Forest Service and the Indiana State Board of Health encourage all interested teachers and students to participate in this unique and relevant process approach to environmental education.

Harold H. Negley, Ed.D.
State Superintendent of Public Instruction

William T. Paynter, M.D.
State Health Commissioner

This publication is printed on recycled paper.

Preface

The purpose of this interdisciplinary instructional design is three-fold. At its basic level it serves as an activity-based program guide for developing in students and instructors, grades 4-12, the ability to observe, assimilate and interpret the world around them.

On another level it provides the "hands-on" experiences that open the bounds of the usual four-walled classroom and allows the student and instructor to develop a learning motif that is limited only by their imaginations.

Finally, at its most creative level, the design is structured to acquaint student and instructor with the principles of values and decision-making.

Through a multi-disciplined approach, the design attempts to ergage student and instructor in the complex problems of priorities and personal world. Confidence and curiosity should be magnified through this exercise, exciting student and instructor to step beyond the limits of their present knowledge.

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Introduction

The environmental investigation lesson plans in this packet are designed to help teachers take an in-depth look at different components of the environment. The plans were developed with the assistance of specialists in educational processes and educators, students and resource-agency people for whom they are designed. They have been field-tested in environmental education workshops throughout the country.

The lesson plans provide a structure for learning in which one activity builds on others and leads to some generalizations about the environment. These generalizations, in turn, can provide a basis for a better understanding of environmental problems and their possible solutions. Even though the investigations are structured, they allow the student freedom to observe, collect, record and interpret data at his own pace and level of understanding. The lessons also are designed to elicit a maximum of student response and involvement through the use of discussions and questioning techniques. In many instances, charts, tables and other aids are included to help the student interpret the data he has collected.

The techniques used in these investigations – such as collecting observable data, making inferences, setting up investigations to check inferences, communicating feelings and awareness – can also be used in investigating other problems and other components of the environment. However, the activities used are not all repeatable, and the teacher will need to develop activities appropriate to new situations.

Lesson Plan Components

Each investigation contains suggestions for "setting the stage," a series of tasks to be done individually or in small groups, task card samples to be used with these activities, summary activities and questions, supplementary charts and tables where appropriate and, in some instances, additional information about the type of teaching activity to be used.

Processes
The educational processes of (1) collecting data from primary sources, rather than from books or lectures, and (2) of group problem-solving have proved to be particularly useful in environmental education. Evaluations from workshops indicate that these processes facilitate an understanding of environmental interactions and interdependence, as well as a development of concepts by the learners about the environment. These two basic processes or approaches are used throughout the investigations.

Self-Directed Task Cards
Task cards, which have been developed for most of the activities, appear in the appropriate place in each lesson. Some of them represent activities which can be used separately from the rest of the lesson. In all cases it is recommended that the task cards be separated from the rest of the lesson plan and be given to students as they are needed.

Discussion Questions
Discussion questions are used to introduce and to summarize each activity or task. Such questions immediately involve the student in a way that lectures or instructions from the teacher do not.

Discussion questions are open-ended in that more than a "yes" or "no" response is required. The learner has the opportunity to contribute the data he has collected as well as his thoughts about that information.

The summarization of tasks and lessons, which also uses questions and discussion, is one of the most important parts of each investigation. The questions used are designed to:

1. Provide opportunities to discuss the implications of what has been learned about the environment for management of the environment.
2. Assist the participant in developing his own concepts and generalizations about what he has done and the ways in which he has learned.

Behavioral Outcomes

Since educators now prefer to evaluate learning experiences in terms of the subsequent observable behavior of students, some minimal expectations concerning the acquisition of knowledge and skills have been described. Possible behavioral outcomes in the areas of environmental feelings, awareness, values and action are also listed.

Conducting the Investigations

The following guidelines may help in conducting the environmental investigations in this packet. They are not flawless, of course, and may require some adaptation in different situations. They take into consideration some of the stumbling blocks that can interfere with the student's fullest involvement in learning activities.

1. Minimize as fully as possible the amount of lecturing, showing or telling.
2. Briefly go over the objectives of the investigation with the students so they will know what to expect.
3. Do a personal preview of the investigation in the place where it is to be conducted.
4. Plan and pace the session so that each task can be done thoroughly and well.
5. If there are time restrictions that prevent doing an entire investigation, decide in advance which tasks are to be omitted. Don't get trapped into rushing so much that you provide all the data verbally instead of allowing students to collect it.
6. Use the lesson plans as a guide, particularly for the questioning and discussion periods, but don't hesitate to revise as necessary once the plan has become familiar.
7. Start the summarization of the investigation at least a half hour before the time period ends. Since these summaries focus on applying what is learned in the investigations to land management and environmental problems, they are extremely important and should be given ample time.
8. Use the summarizations as evaluation tools. The discussion that concludes each session will reveal what concepts and understandings have been acquired by students and what additional information they may need.
9. Include a discussion of ways the investigation can be used in classrooms or on schoolgrounds, giving special consideration to ways environmental studies can be integrated with other subject areas of the school curriculum.
10. Do a self-evaluation of the session while it is still fresh in mind so that improvement can be made for later sessions.

Moving people from place to place and having enough equipment may not be the most important factors in an instructional activity; however, too little attention to these can detract from the success of the instruction, so consider the following:

1. Make sure that you have enough equipment and that it is in working order.

2. Plan for checking out and returning the equipment. It is usually best to assign a student to this job.
3. Discuss possible hazards, regulations and sanitary provisions with the students before leaving for the study area.

Conclusion

The ideas and activities in these teaching materials will not come to life until you have tried them, modified them and improved them to fit your own needs and the needs of the location. Every teacher has an individual style, and the lesson plans should be used to fit that personal style.

Additional lesson plans for investigating other elements of the environment are being developed and will be added to the packet from time to time. If you wish to receive these as they become available, send your name to: Indiana State Board of Health, Division of Health Education, 1330 W. Michigan Street, Indianapolis, Indiana 46202.

Investigations for Land Use Planning

Set the stage for this investigation by reviewing quickly what will take place in the allotted time. For example: "In the next four hours we will develop some skills and apply them to collecting and interpreting data about the soil environment and then apply that data to making some decisions about what might be the best uses of this land." You might want to read the behavioral objectives which appear at the end of this lesson plan and refer back to them as an evaluation of the session.

Adapting Lesson Plan to Your School and Community

Name of Lesson: Investigations for Land Use Planning.

Process Skills: Observing, testing, collecting, interpreting, inferring, investigating, communicating, predicting, recording, describing (feelings, values, understandings) constructing, analyzing.

Suggested Grade Levels: 4-12. Each educator will need to adapt this material to individual and group needs.

Suggested Disciplines: Social Studies, Science, Mathematics, Health, Language Arts, Creative Arts. This interdisciplinary activity involves students by utilizing process skills and many disciplines to experience, understand or improve local environs.

Environmental Study Sites: This lesson plan can be used in a rural, suburban or urban environment such as school grounds, city and state parks, farms, yards, industrial sites, forests, roads and building sites.

Designing Additional Experiences: Educators and students interested in designing similar environmental learning experiences should secure a copy of *Total Environment Education*, a K-12 interdisciplinary design which asks individuals to analyze and actively pursue activities in order to understand and improve their environs. See resource list for address.

I. DESCRIBING SOIL

When you first meet the group, have them sit down and do Task A:

TASK A: (5 minutes) Work by yourself.

In your own words, describe soil.
Keep this description for your own reference at the end of the session.

II. OBSERVING AND RECORDING THINGS IN THE SOIL

Distribute Task B cards and have class work in groups of three or four and report findings in 15 minutes.

TASK B: (15 minutes) Work in small groups.

1. Predict what things you will find in the top few inches of this forest floor. List your predictions:

2. Stake out an area two or three feet square on the forest floor and sift through the top three inches of the soil, recording the evidence of plants and animals you observe.

Name or description of item in the soil	*Quantity*	*Possible effect on soil*

3. The following three terms are used t6 describe organic matter at the top of the soil: *litter, duff, humus*. From your study above, complete the following chart:

Term and definition	*Describe the feel*	*List the identifiable parts of plants and animals you found*
Litter (identifiable dead things on surface)		
Duff (partially decomposed organic matter compacted)		
Humus (almost completely decomposed, nonidentifiable organic matter)		

Questions and discussion:

1. What did you find?
2. When would you expect to find more organisms? different organisms?
3. How do the organisms you found benefit the soil?
4. What are some reasons for odors in the soil?

III. DEVELOPING THE SKILLS TO COLLECT SOIL DATA

Move the group to the soil profile or soil pit.

Questions and discussion:

1. What can we see as we look at this cross-section or profile of soil?
2. What are some things that would be important to find out about it? Accept all comments. The observable characteristics of color, texture, structure, temperature and the acidity or alkalinity (pH) of a soil are indications of some soil conditions important in land use planning.
3. We are going to collect and record some of this information. For the next few minutes, we will stay together as a group to develop skills in collecting soil data. After that, you will be working on your own.

Quickly (10 minutes) go over the following items about soil and collecting the data. This instructional session is extremely important. The participants will use the skills they develop in this session when they collect data for the micromonolith.

Soil Components (not necessary to discuss in this order)

1. *Soil layers* (horizons)
   Mark where the soil changes color and general appearance. Many soils have three major layers or horizons, i.e., top soil, subsoil and parent material. Because soil formation has many variables, you may find only one or two layers. Of the major layers you do find, measure and record the depth of each.

2. *Color*
   Describe and record the color of each major layer. Have participants pick their own description of color.

3. *Texture* (how the soil feels)
   Determine and record the texture of each major layer.

   Texture is determined by feel. Push and rub moistened sample between thumb and forefinger. Spit on sample to moisten.

   If it feels gritty – sand
   If it feels smooth and slick, not very sticky – – – – – – – – – – silt
   If it feels smooth, plastic, *very* sticky – – – – – – – – – – – – clay

NOTE: *Have samples of sand, silt and clay in cans. Have participants practice with these samples to find out what the textures feel like before determining textures of the soil profile under study.*

4. *Structure* (how the soil is put together)
   Determine the structure of each major layer. Carefully break apart a shovelful of soil from

each layer and match its characteristics with one of the structure words on the work card. (Task C)

5. *Temperature*
   Determine and record the temperature of each layer. Plant's growth depends upon soil temperatures during the *growing season*. Find out growing season in the study area in advance.

6. *pH (acidity or alkalinity)*
   Determine and record the pH of each major layer. Plants need many soil nutrients to grow well. The degree of pH also affects how plants grow.

NOTE: *Demonstrate how to use pH kit in front of whole group. Use some foreign material like cigar ashes as a demonstration. Tell the students not to pack the sample too tightly. Use just enough pH reagent to saturate soil sample. Match color at the edge of the soil sample in porcelain dish with pH color chart.*

IV. CONSTRUCTING A SOIL MICROMONOLITH

Explain that the skills just developed are going to be used to construct a soil micromonolith. Explain that a micromonolith is a small cross-section of the soil profile. You can make one by just sketching the layers on the profile sketch or by putting samples of each layer in a baby food jar or other clear container. Distribute Task C cards. Notice that there is a place to check or record the data collected and a place to sketch what the soil looks like.

TASK C: (20-30 minutes) Work in small groups or by yourself.

Using the skills you have just developed and the available equipment, construct a soil micromonolith of this soil profile. Record your observations on the soil micromonolith lab sheet. You may want to make a micromonolith using the cards and jelly cups; if so, ask your instructor.

When finished with this task, report to the instructor to receive Task D.

Air temperature 3 feet above soil surface	
Air temperature just above soil surface	

Sketch your soil profile, label the layers or horizons and record the data.

PROFILE SKETCH

DATA

Contents of material above soil: _____

_____ , Depth _____ " to _____".

A. (Horizon): Depth _____" to _____", Color _____
Topsoil
Texture: Sand ____, Silt ____, Clay ____
Structure: Columns ____, Blocky _____, Platey _____,
Granules _____, pH _____, Temp._____, _____^{O}F, Plant roots visible_____ .

Record below the same information above for the rest of the layers.

Describe type of rock in the bedrock (if present) _____

_____

_____

_____

V. ANALYZING YOUR SOIL DATA

TASK D: (20 30 minutes) Work in small groups or by yourself.

Using the soil data you collected and the following tables, answer the following questions:

Effect of soil depth on plant growth and water storage

Deep soil (over 42")	Excellent water storage and plant growth
Mod. deep soil (20"-42")	Good water storage and plant growth
Shallow soil (20" and under)	Poor water storage and plant growth

The potential of my soil for water storage and plant growth is:

Excellent _____ Good _____ Poor _____

Why? _____

SOME RELATIONSHIPS OF COLOR TO SOIL CONDITIONS

Top soil condition	*Dark (dark grey, brown to black)*	*Moderately dark (dark brown to yellow-brown)*	*Light (pale brown to yellow)*
Amount of organic material	Most	Moderate	Low
Erosion factor	Low	Medium	High
Aeration	Excellent	Good	Low
Available nitrogen	Excellent	Good	Low
Fertility	Excellent	Good	Low

Subsurface soil color (B horizon)	*Condition*
Dull grey (if in low rainfall soils)	Water-logged soils, poor aeration
Yellow, red-brown, black (if in forest soils)	Well-drained soils
Mottled grey (if in humid soils)	Somewhat poorly to poorly drained soils

a. What can you say about the following, based on the color of the top soil, or A horizon?
   Amount of organic material _____
   Erosion factor _____
   Fertility _____

b. What can you say about the drainage in the B horizon, based on color?

_____

_____

Effect of texture on soil	*Water holding capacity*	*Looseness of soil*
Sand	Poor	Good
Silt	Good to excellent	Good
Clay	High (Plants can't use it in clay.)	Poor

My soil texture	*Soil water-holding capacity*	*Looseness*
Topsoil (A)		
Subsoil (B)		

EFFECTS OF STRUCTURE ON SOIL CONDITIONS

Type	*Penetration of water*	*Drainage*	*Aeration*
Columns	Good	Good vertical	Good
Blocky	Good	Moderate	Moderate
Granular	Good	Best	Best
Platey (like a stack of plates)	Moderate	Moderate	Moderate

Using the structures you recorded, and the chart above, what can you say about the drainage properties of your soil for:

Topsoil (A) _____

Subsoil (B) _____

1	4.5	6.5	7	8.5	14
(1 to 4.5 is too acidic for most plants)		(Most plants do best here)		(8.5 to 14 is too alkaline for most plants)	

Examples of plants in pH range:
pH 4.0-5.0: rhododendrons, camellias, azaleas, blueberries, fern, spruce
pH 5.0-6.0: pines, firs, holly, daphne, spruce, oaks, birch, willow, rhododendron
pH 6.0-7.0: maple, mountain ash, pansies, asters, peaches, carrots, lettuce, pines, firs
pH 7.0-8.0: beech, mock orange, asparagus, sagebrush

Using the pH ranges you recorded and the table above, complete the following chart:

Some plants that could grow here based on the pH and chart	*Some plants actually observed growing here*

Did your inferences about the soil pH-plant relationships check out?

Yes _____ No _____ Explain: _____

Is pH the only factor affecting where plants grow? Yes _____ No _____

Explain: _____

Describe in a short paragraph how you would set up an experiment to collect data and construct your own soil pH-plant relationship chart.

SOIL TEMPERATURE

Soil temperature	*Conditions during growing season*
Less than 40° F	No growth; soil bacteria and fungi not very active
40° F to 65° F	Some growth
65° F to 70° F	Fastest growth
70° F to 85° F	Some growth
Above 85° F	No growth

The growing season for my area is _____

What does the soil temperature chart tell you? _____

_____

In the space below, convert the soil temperature table to a line graph. (5-10 minutes) Work by yourself.

VI. DETERMINING SOME LAND USES

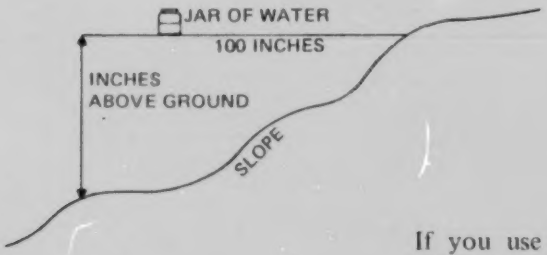
Questions and discussion:

Explain to students that all the information needed to discuss some land uses of the study area, except the slope of the land, has been obtained. Distribute Task E. Demonstrate its use and have students work in small groups to measure other slopes in the study area.

TASK E:

Determining the slope of the land:

1. Select a place that represents the average slope of the land being studied or take several measurements and average them.
2. Place one end of a 100-inch stick on the slope you want to measure. Hold out straight until level.
3. Place a level or jar with some liquid in it on the outright stick. Raise or lower the stick until level.
4. Measure the number of inches the free end of the stick is above the ground.
5. The number of inches is the slope of the land in percent.



If you use a different length stick, correct by using the conversion table below.

CONVERSION TABLE

Length stick used	*No. inches the end of the stick is above the ground*	*Multiply by conversion factor*		*Per Cent Land*
100"	_____	X	1	=
50"	_____	X	2	=
25"	_____	X	4	=

LAND USE CHART

This is a chart for soils for one kind of land, climate and plants. Other areas may require a different set of criteria.

Agriculture uses	*Slope*	*Erosion hazard*	*Soil depth*	*Drainage*	*Texture*
Farm crops – cultivation, good soil management practices	0-3	None	Deep	Well-drained	Loam or silt loam
Farm crops – few to several special cultivation practices	3-20	Slight to moderate	Moderately deep	Somewhat poorly	Sandy loam or silty clay

LAND USE CHART

Agriculture uses	*Slope*	*Erosion hazard*	*Soil depth*	*Drainage*	*Texture*
Occasional cultivation, many special practices	20-30	Severe	Shallow	Poor	Sand or clay
Pasture-woodland cultivation, no machinery can be used	0-2	None to slight	Deep	Well to poor	Stoney
Pasture, timber growing, woodland, wildlife, no cultivation machinery	30-90	Very severe	Deep to shallow	Well to poor	Sandy, silty, claying or rocky
Wildlife, recreation	All	None to extreme	Deep to shallow	Excessive to poor	Rockland, river wash, sand dunes

The most limiting soil factor will determine the best agricultural use of the land.

Occupancy Land Uses by Man:

Man's varied uses of land has demanded criteria to determine proper management practices for living on the land. Examples in addition to agricultural uses include: prescriptions for aesthetic management, soil site indexes for growing timber and criteria for greenbelts.

Some uses and factors affecting that use	*Slight limitation*	*Moderate limitation*	*Severe limitation*
Roads and Streets			
Slopes	0-12%	12-30%	Over 30%
Depth	Over 40"	20-40"	Less than 20"
Water table	Over 20"	10-20"	Less than 10"
Building Sites			
Slopes	0-12%	12-20%	Over 20%
Depth	Over 40"	20-40"	Less than 20"
Water table	Over 30"	20-30"	Less than 20"
Septic Tank Filter Fields			
Slope	0-7%	7-12%	Over 12%
Depth	Over 6'	4-6'	Less than 4'
Water table depth below trench	Over 4'	2-4'	Less than 2'
Picnic and Camp Areas			
Slope	0-7%	7-15%	Over 15%
Stones	0-20%	20-50%	Over 50%
Water table during season of use	Over 30"	20-30"	Less than 20"

Distribute Task F cards.

TASK F: (20 minutes) Work in small groups.

Using the data from Task D, Task E and the Land Use Chart (preceding page), answer the following questions.

According to the agriculture and occupancy land use charts, this land could be used for:

Agriculture use (list and explain why):

Occupancy (yes or no and with what limitations):

Roads and streets

Building sites

Septic tank filter fields

Picnic and camp areas

I feel the best uses of this land would be (justify your answer):

Questions and discussion:

1. How have you classified this land?
2. Based on your observations and the data you collected, do you feel this land is being properly used?
3. In your estimation, have man's activities affected the classification of this land?
4. Could man improve the capability of this area? How?
5. How could man reduce the capability of this area?

Distribute Task G cards.

TASK G: (10 minutes) Work by yourself.

Using the words from the data you collected and recorded on the soil micromonolith card, write a description of the soil in your soil study. Compare this description with the one you wrote at the beginning of the session.

Questions and discussion:

1. What are some factors that contribute to soil formation?
2. What evidences of geological changes have you noticed in this area?
3. What other factors might affect uses of the land? (climate, growing season, needs of community, economic, past history of uses, etc.)

VII. COMMUNICATING FEELINGS, AWARENESS AND VALUES ABOUT SOIL

Distribute Task H cards.

TASK H: (10 minutes)

Describe what you can do to improve the use of the soil in your backyard and in your community.

Questions and discussion:

1. Ask for individual descriptions and have group discussion. Relate back to the responses given to questions after Task F.
2. What types of community action can we take to identify and help solve soil and land management problems in our community? How do these relate to zoning laws, planning commissions, local and state political decision-making?
3. Take these data or processes of collecting data and identify a local land use problem and develop a simulation game similar to the Center Place Game. (See Lesson Plan Outline for an Environmental Land Use Simulation Game.)

Summary questions:

1. What did we find out about the environment in our study today?
2. How are soil characteristics important in environmental management?
3. How can we summarize our discussions and investigations?
4. What processes and methods did we use in our investigation today?
5. Let's review the behavioral outcomes for this session to see if we achieved our objectives. Read list and have group comment.

TASK I:

Describe in writing how you feel about our session today. (Evaluation)

Behavioral Outcomes in Knowledge

As a result of this session, you should be able to:

Describe three ways in which the living organisms in the top part of the soil affect the soil.

Construct a soil micromonolith of an assigned soil profile, determine and record texture, structure, pH, temperature and color of each layer.

Write a description of a soil you studied, using the words you recorded about that soil on your micromonolith.

Demonstrate the ability to determine the best uses of the land in this area, using the data from your soil micromonolith and the land capability charts.

Describe three things that man does to determine the proper management of the soil resource.

Behavioral Outcomes in Feelings, Awareness, Values and Action

As a result of this session, you should be able to:

Describe how you feel about man's effect on this soil environment.

Describe how you feel about man's effect on the soil environment where you live.

Describe what you can do to improve the use of the soil in your backyard and in your community.

Equipment Needed (for a class of 30 students)

6 La Motte soil pH kits	100 jelly cups and lids	3 staplers
30 micromonolith cards	3 soil thermometers	1 box staples
6 tape measures	2 No. 10 cans of water	2 shovels
30 sets of lab sheets	30 hand lenses	3 yardsticks
3 sticks (50" or 100" long)	3 baby food jars, ½-full of water	Labels to differentiate soil horizons

Measuring Water Quality Criteria

Set the stage for this investigation by reviewing quickly what will take place in the allotted time. For example: In the next four hours we will investigate evidences of aquatic life in this stream, infer stream temperature, 0_2 and pH from that life, and then check out our inferences through experimentation. We'll determine the streamflow of the stream and discuss ecological, social and political concerns of using such water. You might want to read the behavioral objectives which appear at the end of this lesson plan and refer back to them as an evaluation of the session.

Adapting Lesson Plan to Your School and Community

Name of Lesson: Measuring Water Quality Criteria

Process Skills: Observing, testing, collecting, interpreting, investigating, communicating, predicting, measuring, recording, describing, (feelings, values, understanding), constructing, inferring, analyzing.

Suggested Grade Levels: 4-12. Each educator will need to adapt this material to individual and group needs.

Suggested Disciplines: Social Studies, Science, Mathematics, Language Arts, Creative Arts, Health. This activity involves students by utilizing process skills in a variety of disciplines to experience, understand or improve local environs.

Environmental Study Sites: This lesson plan can be used for streams, gravel pits, ponds, lakes and rivers in a rural, suburban or urban environment.

Designing Additional Experiences: Total Environment Education (See resource list)

I. DETERMINING WATERSHED BOUNDARIES

Distribute maps of the area, one for each person.

TASK A: (15 minutes) Work in small groups.

Find _____ Creek on the map. Find your location.
Where does the water in this stream come from? Trace upstream to its source.
Draw lines around the boundaries of our watershed. We're in the _____ Creek watershed.

II. OBSERVING THE STREAM ENVIRONMENT

Assign Task B for recording observations of the stream environment. Walk to stream. Distribute Task B cards.

TASK B: (10-15 minutes) Work by yourself or in small groups.

As you approach the stream, observe and record your observations about the stream environment (Can be done visually and verbally):

Plants _____

Animals _____

Air _____

Rocks _____

Water _____

Questions and diseussion:

1. What did you notice about the stream environment?
2. What plants were growing on the gravel bar?
3. Why aren't large trees growing on the gravel bar?
4. What did you notice about the rocks?
5. Where did you see the bigger rocks? the smaller?

III. OBSERVING AQUATIC ANIMALS

Questions and discussion:

1. What did you notice about the water in the stream?
2. What do animals need to live in water?
3. Where would you expect to find animals in the water?
4. What guidelines need to be developed by our group as we collect animals from the stream? Discuss what to do with animals kept for observation, what to do with rocks that are overturned, what to do with animals when the session is over.

Distribute Task C cards.

TASK C: (30-40 minutes) Work by yourself or in groups.

Using collecting equipment (screens, jelly cups, etc.), collect as many types of aquatic animals as possible. Put them in the white containers for observation by the group. Keep the pan in a cool place. When you're finished, contact the instructor to receive the next task.

NOTE: *Go from group to group to see how the students are doing.*

IV. IDENTIFYING AND RECORDING AQUATIC ANIMALS

Distribute Task D cards.

TASK D: (20-30 minutes) Work by yourself or in groups.

Using the *Golden Nature Guide Pond Life* books or similar field manuals, generally identify the specimens you found.

List or sketch the animals you found below.

Description of where found	*Type (name or sketch)*	*No.*

Return animals to water as soon as finished.

Questions and discussion:

1. What animals did you find? Compile a group list, preferably on a chart. Each person should record the group list on his own work sheet (Task D).
2. Where did you find most of the specimens?
3. What similarities are there among the specimens?
4. What differences did you find?
5. What classification system could we use to classify the aquatic animals we found?
6. What other life would you expect to find in this stream?
7. Would we be likely to find the same specimens in a different aquatic environment? Why or why not?

V. PREDICTING WATER CHARACTERISTICS FROM AQUATIC ANIMALS FOUND

What were the things we said animals needed in order to live in the water? Review earlier discussion.

Assign the following task:

Distribute Task E cards.

TASK E: (15-20 minutes) Work by yourself.

Based on the aquatic animals you found, and the charts below in the Analyzing Data section, predict the following characteristics of this stream:

I predict:

the water temperature will be _____ because _____

the air temperature will be _____ because _____
the pH number will be _____ because _____
the dissolved O_2 count will be _____ because _____

Keep these predictions for your own reference.

ANALYZING DATA

pH Ranges That Support Aquatic Life

	Most acid					Neutral								Most Alkaline
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Bacteria	1.0												13.0	
Plants (algae, rooted, etc.)						6.5						12.0		
Carp, suckers, catfish some insects						6.0			9.0					
Bass, crappie						6.5		8.5						
Snails, clams, mussels							7.0		9.0					
Largest variety of animals (trout, mayfly, stonefly, caddisfly)						6.5	7.5							

DISSOLVED OXYGEN REQUIREMENTS FOR NATIVE FISH AND OTHER AQUATIC LIFE

	Dissolved oxygen in parts per million
Cold water organisms (including salmon and trout – below 68°)	
Spawning	7 ppm and above
Growth and well-being	6 ppm and above
Warm-water organisms (including game fish such as bass, crappie – above 68°)	
Growth and well-being	5 ppm and above

APPROXIMATE TEMPERATURE RANGES REQUIRED FOR GROWTH OF CERTAIN ORGANISMS

Temperature		*Examples of life*
Greater than 68 ^{o} (warm water)		Much plant life, many fish diseases. Bass, crappie, bluegill, carp, catfish, caddisfly
Less than 68 ^{o} (cold water)	Upper range (55-68 ^{o})	Some plant life, some fish diseases. Salmon, trout, Stonefly, mayfly, caddisfly, water beetles, striders
	Lower range (Less than 55 ^{o})	Trout, caddisfly, stonefly, mayfly

Questions and discussion:

1. Discuss the range of predictions as a group.
2. What criteria did you use to arrive at your predictions?
3. How can we test out our predictions?

VI. MEASURING AND RECORDING WATER CHARACTERISTICS TO TEST OUT PREDICTIONS

Directions to group:

We can test out the predictions we just made, using the Hach O_2 pH Testing Kit or equivalent. Open the kit and read the instructions on the inside of the lid.

There are many jobs to be done in the testing, such as clipping, squirting, swirling, dipping, counting and reading, so make sure everyone in the group has a job to do. Work in groups of 5-6 persons each. Each group should take a kit. Send groups to different parts of the stream.

NOTE: *It is not necessary to demonstrate the use of the kit. Let the students do it. Task F could be taped somewhere on the water test kit.*

Distribute Task F cards.

TASK F: (20-30 minutes) Work in groups of 4-6 students.

Make sure everyone in the group gets involved in the testing. Using the water test kit, determine the water temperature, air temperature, dissolved oxygen count and pH of the stream.

Record the data below: Also record and compare predictions from Task E.

Location of water sample (edge or middle of stream)	*Time taken*	*Temperature*				*pH*		*Usable oxygen (ppm)*	
		Water		*Air*					
		My prediction	*Actual test*	*My prediction*	*Actual test*	*My prediction*	*Actual test*	*My prediction*	*Actual test*

Questions and discussion:

Have each group report the results of their tests to the entire group. Compare results.

1. What might account for any differences in results from each group?
2. How did the test results compare to the predictions?
3. Is it necessary to have sophisticated equipment to determine temperature, oxygen, pH, etc.? Inferences could be made from the animals found in the stream.
4. What can we say about the quality of the water in this stream?
5. What else would we need to know to decide whether or not to drink this water?
6. Under what conditions might we expect to get different test results than we did today?

VII. MEASURING STREAMFLOW (Use if investigation is being made along a stream.)

Distribute Task G cards.

Questions and discussion:

1. What measurements do we need to know in order to determine the amount of water in this stream? Discuss how to make different measurements. See Task G.
2. Predict how many people could live off the water in this stream. _____

TASK G: (45 minutes)

DETERMINATION OF STREAMFLOW

Instructions for collecting and recording streamflow measurements:

a. Measure and mark a 100-foot distance along a straight section of your stream. If you can't find a 100-foot section, use a 25- or 50-foot section. Throw a stick 2 or 3 inches long into the water above the upstream marker. Record the number of seconds it takes to float downstream between the markers. Record below. Now divide the 100-foot distance by the total seconds it took the stick to float between the stakes.

100 ft. ÷ _____ = _____ ft. per second
(distance) (total seconds to float 100 ft.) (number of feet stick floated each second)

b. Find the average width of your section of the stream. Measure the width of the stream at three places within the 100-foot area. Divide the total by 3 to get the average width of the stream.

First measurement _____ feet.
Second measurement _____ feet.
Third measurement _____ feet.
Total _____ feet ÷ 3 = _____ ft. (average width)

c. Find the average depth of your section of the stream. Measure the depth of the stream in at least three places across the stream in a straight line. Divide the total by 3 to get the average depth of the stream.

First measurement _____ feet.
Second measurement _____ feet.
Third measurement _____ feet.
Total _____ feet ÷ 3 = _____ ft. (average width)

d. Find the cubic feet of water per second. Multiply the average width, average depth and the number of feet the stick floated each second.

_____ ft. X _____ ft. X _____ = _____
Average width | Average depth | Number of feet per second | Cubic feet of water flowing per second

NOTE: *A cubic foot of water is the water in a container 1 foot wide, 1 foot high and 1 foot long, containing 7.48 gallons.*

In order to find out how many people could live from the water in this stream, complete the following calculations.

_____ X 7.48 = _____
Stream flow in cu. ft. per sec. | Gallons in 1 cu. ft. of water | Gallons of water per sec.

_____ X 60 = _____
Gallons per sec. | Seconds in minutes | Gallons of water per min.

_____	X	1440	=	_____	÷	*200 gals	=	_____
Gallons of water per min.		No. minutes in a day		Total gallons water per day		Amount of water one person uses per day		Total no. people who could live from water in this stream

**The average person uses about 200 gallons of water a day for home use. This does not reflect each person's share of water used for industrial, commercial and public services.*

Questions and discussion:

1. How many people in a community could live off the water in this stream?
2. What would happen to this environment if we piped all the water out of the stream to a community?
3. If we were going to use this water, how much water should be left to flow downstream? Why?
4. Does this stream always have this amount of water in it? Why?
5. What are some problems you encountered during this task?

VIII. COMMUNICATING FEELINGS, AWARENESS AND VALUES ABOUT WATER

Questions and discussion:

How important is this stream to us?

Distribute Task H cards.

TASK H: (10-15 minutes) Work by yourself.

1. Describe in writing how you feel about man's effect on the aquatic environment at this site:

2. Describe at least one action you can take in your everyday life to help improve the way water is managed:

   (a) in your home: _____

   (b) in your community: _____

   (c) in your consumer habits: _____

3. Describe the benefits of each action, listed in Question No. 2.

Summary questions:

1. What did you find out about water from our investigations today?
2. Why is water important to the ecosystem?
3. How can we summarize our discussions and investigations?
4. What methods and processes did we use in our investigations today?

Distribute Task I cards.

TASK I:

Describe in writing how you feel about our session today.

Behavioral Outcomes in Knowledge

As a result of this session, you should be able to:

Identify the boundaries of the _____ Creek watershed on the map provided.
Predict the pH, temperature and dissolved oxygen count of the stream, using the list of aquatic animals found and the water interpretation charts provided.
Demonstrate the ability to test out the above predictions using the water testing kit.
Measure the cubic feet of water per second flowing in the stream and determine what size community could live off the water in the stream.
Describe three ways this stream is important to the surrounding environment.

Behavioral Outcomes in Feelings, Awareness, Values and Action

As a result of this session, you should be able to:

Describe in writing how you feel about man's effect on the aquatic environment at this site.
Describe at least one action you can take in your everyday life to help improve the way water is managed in your home, in your community and in your consumer habits.
Describe the benefits of each of the above actions.

Equipment Needed (for a class of 30 students)

4 water testing kits (Hach Co. or equivalent)
4 thermometers
4 white dishpans
30 sets of lab sheets
30 jelly cups
30 hand lenses
15 *Golden Nature Guide Pond Life* books
30 maps of the area
4 50' or 100' tapes
4 screens (optional)
Felt tip markers
Chart paper

Investigating Environmental Habitats

Set the stage for this investigation by quickly reviewing what will take place in the allotted time. For example: In the next four hours we will investigate several environmental habitats, infer how animals fit into food chains and energy cycles and discuss what we can do as citizens to improve the biological interactions in our environment. You might want to read the behavioral objectives which appear at the end of this lesson plan and refer back to them as an evaluation of the session.

Adapting Lesson Plan to Your School and Community

Name of Lesson: Investigating Environmental Habitats

Process Skills: Observing, testing, collecting, interpreting, investigating, inferring, communicating, predicting, measuring, recording, describing (feelings, values, understandings), constructing, analyzing.

Suggested Grade Levels: 4-12. Each educator will need to adapt this material to individual and group needs.

Suggested Disciplines: Social Studies, Science, Mathematics, Language Arts, Creative Arts, Health. This activity involves students by utilizing process skills in a variety of disciplines to experience, understand or improve local environs.

Environmental Study Sites: This lesson plan can be used in a rural, suburban or urban environment, such as an empty lot, alley, forest, meadow, school ground, fish and game area and publicly owned park.

Designing Additional Experiences: *Total Environment Education* (See resource list)

I. OBSERVING AND MEASURING ANIMAL SIGHTINGS AND EVIDENCES

Questions and discussion (10 minutes):

1. What animals would we expect to find living in this area, vertebrates or invertebrates?
2. What are the needs of these animals?
3. What are some names of the places where animals live?
4. Where would you look for animals around here?
5. Describe and pass out Task A and B cards.

TASK A: (30 minutes) Work in small groups.

1. Explore as many places (environments or habitats) as you can from (point out boundaries) _____ to _____ and record any evidence of animals that you find. As you inventory, figure out some way of recording *amounts* of evidences and animals seen.
2. Look for and list signs of animals, such as partly consumed foods, excrement, homes, bird nests and feathers.
3. Observe and list different habitats for area wildlife (grass, cultivated field, hedges, swamps, etc.).

4. Observe and list animal foods in area:

TASK B: (30 minutes) Work in small groups.

Select three different habitats and compare the numbers and characteristics of each animal organism.

Habitat I	Habitat II	Habitat III
Characteristics of Habitat I	Characteristics of Habitat II	Characteristics of Habitat III

Questions and discussion:

1. What animals did you find in each habitat?
2. Which habitat had the most animals? Why?
3. What were the characteristics of each habitat?
4. What could account for the differences and similarities of the habitats?
5. What factors made one habitat more desirable than another?
6. Pass out Task C cards.

TASK C: (15 minutes)

Build a food pyramid comparing the number of animals observed with the amount of animal evidences seen.

Questions and discussion (15 minutes):

1. What did you find?
2. How many habitats did you investigate?
3. Which animals around here have the largest habitat? The smallest?
4. What was the largest group of animals found?
5. What do you think their main function in the environment might be?

Discuss terminology and definitions of herbivores, carnivores, omnivores and decomposers. Distribute Task D cards.

TASK D: (10 minutes)

List observed animals and their evidences in the appropriate place in this diagram. Use arrows to show direction of relationships, i.e., energy flows from the sun to living things; plants support herbivores. What other words and ways can you think of to illustrate a similar cycle? Some people call this the energy cycle.

Light

Plants

Nutrients

Herbivores (plant eaters)

Decomposers (bacteria-fungus)

Death

Carnivores (meat eaters)

What would happen if one group were eliminated?
If _____ group were eliminated, I think the following would happen:

Questions and discussion (5 minutes):

1. What is the function of each part of the energy cycle?
2. What would happen if the decomposers were removed from this ecosystem?
3. How does the energy cycle relate to a food chain?
4. What is a food chain? (Or, who eats whom?)

Distribute Task E cards.

TASK E: (10 minutes)

Construct a five-stage food chain using specific animals seen so far.

II. OBSERVING AND RECORDING CHANGES IN ANIMAL HABITATS

Questions and discussion (10 minutes):

1. How did your food chain relate to the energy cycle in Task D?
2. What is the difference between food chain and food web?
3. Look at your food chain and see if you can construct a web out of it.
4. What evidences of influences can you name that have affected this environment?

Distribute Task F cards.

TASK F: (20 minutes)

Describe in writing three influences you have discovered that have changed the habitats in this area, including the cause and effect relationships that have occurred. Consider:

1. Evidence of change and the influence or factor causing it.
2. The animals previously inhabiting the area and what the region looked like before the change occurred.
3. What area looks like now and the animals that presently live there.
4. How the change affected the habitat and the animal species living there.

Questions and discussion (10 minutes):

1. Read and compare various descriptions.
2. What evidence did you find indicating man's influence in this area?

III. COMMUNICATING FEELINGS, AWARENESS AND VALUES ABOUT THE ENVIRONMENT

TASK G: (10 minutes)

Describe how you *feel* about man's effect on one animal habitat you observed.

Questions and discussion:

1. Discuss results of Task G with group.
2. What are some things that man has done to effect the efficiency of the energy cycle? Here? Elsewhere?

TASK H: (15 minutes)

Describe in writing three things you can do in your everyday life to make the energy cycle more efficient and cause the least amount of harm to the ecosystem.

Select the one you think would be your best contribution. Describe the benefits of this action in relation to (1) where you live and (2) your consumer habits.

Discuss Results of Task H.

Summary questions:

1. What did we find out about animals in our field study session today?
2. Why are animals important in the ecosystem?
3. How can we summarize our investigations today?
4. What processes and methods did we use to find these things out?
5. Which of the behavioral outcomes did we accomplish in this session? (Read and discuss.)

TASK I:

Describe in writing how you feel about our session today.

Behavioral Outcomes in Knowledge

As a result of this session you should be able to:

Identify and describe six different animal habitats.

Construct a diagram of an energy cycle, using the evidences and sightings of animal life observed at the site.

Describe at least four cause and effect relationships in the role of decomposers in the energy cycle.

Behavioral Outcomes in Feelings, Awareness, Values and Action

As a result of this session you should be able to:

Describe how you feel about man's effect on one animal habitat observed at the site.

Describe three things you can do in your everyday life to make the energy cycle more efficient, causing the least amount of harm to the ecosystem and to your consumer habitat.

Interpreting Landscape in a Forest Environment

Set the stage for this investigation by reviewing quickly what will take place in the allotted time. For example: "In the next four hours we are going to make some inferences about why we think things are the way they are in this setting based on observations, test out those inferences by experimentation, collect and interpret past events in this experiment and explore ways we can improve the efficiency of energy cycles." You might want to read the behavioral objectives which appear at the end of this lesson plan and refer back to them as an evaluation of the session.

The following activities will help you look for observable changes, relationships, patterns and trends in order to interpret past events, understand present relationships and indicate future trends in the forest environment.

Adapting Lesson Plan to Your School and Community

Name of Lesson: Interpreting the Landscape in a Forest Environment

Process Skills: Observing, testing, collecting, interpreting, investigating, inferring, communicating, predicting, measuring, recording, describing (feelings, values, understandings), constructing, analyzing.

Suggested Grade Levels: 4-12. Each educator will need to adapt this material to individual and group needs.

Suggested Disciplines: Social Studies, Science, Mathematics, Language Arts, Creative Arts, Health. This activity involves students by utilizing process skills in a variety of disciplines to experience, understand or improve local environs.

Environmental Study Sites: This lesson plan can best be used in a rural environment although it can be adapted to suburban or urban environments. State, local, national or private, forests, parks, nature centers, outdoor laboratories and farms are examples of study sites.

Developing Additional Experiences: *Total Environment Education* (See resource list).

I. OBSERVING AND INFERRING WITH CROSS-SECTIONS

Use observable evidences to infer past events in a forest.

Distribute cross-sections and Task A cards. Cross-sections of trees should be 4 to 6 inches in diameter or larger and should show a variety of growth patterns and influences (fire, insects, etc.).

TASK A: (5-10 minutes) Work with one or two other people.

Write down what you notice about the cross-sections.

Questions and discussion:

1. What are some things you noticed about the cross-sections?
   Accept all comments from group. List on board or chart.
2. Focus on two or three items for discussion:
   a. Why did you say . . . (your cross-section had evidence of fire)?
   b. What could account for . . . (the rings being irregular)?
   c. What are some things that could account for . . . ?

Distribute Task B cards.

TASK B: (10 minutes) Work with one or two other people.

Select three observations about the cross-sections from the group list.
List possible reasons for these observations.
List ways you could set up an investigation to find out more about your observations and inferences.

Observation (what you noticed)	*Inferences (possible reasons for this)*	*Investigations (how we could find out)*
1.		
2.		
3.		

Questions and discussion:

1. Ask for reports on the above chart from several groups (as time allows).
2. Which of these investigations could be carried out in the study area?
3. Keep the lists of observations and inferences for reference at the end of this session.
4. What could tree rings from this forest tell us about past and present events in this environment?

II. COLLECTING AND INTERPRETING DATA ABOUT TREE GROWTH RATE AND COMPETITION

Task C (with tree cores) requires preparation by the instructor before the session.

A tree stand should be selected for study and four or five trees tagged. Selected trees should be those which show effects of environmental conditions, such as injury, overcrowding and lack of sunlight. The tagged trees should be bored with an increment borer ahead of time. Resulting cores should be numbered to correspond with the tree number. Put tree cores in see-through plastic straws that are taped to a cardboard or place in liquid resin, plastic wrap or other transparent material to facilitate handling. If study area is to be used repeatedly, save cores to eliminate the necessity of reboring.

NOTE: *If trees showing effect of various environmental conditions are difficult to find, stumps of trees that grew under a variety of competitive influences can also be used for study instead of tree cores.*

Distribute Task C cards.

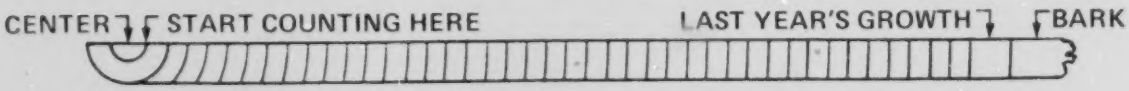
TASK C: (Part 1: 15-20 minutes) Work in groups of four to five people.

1. Observe the tree core your group has been given. Refer to drawing of tree core to help interpret the tree core and record the following information:

Tree No.	*No. dark rings from center to bark (approx. age)*	*No. dark rings in last inch*	*Remarks about the pattern of the rings*

2. When your group has the above information, one person from the group should record this information on the blackboard or chart. This chart will also be used for Part 2 of Task C.

DRAWING OF TYPICAL TREE CORE



Part 2: (10-15 minutes) Work in small groups.

Record the following information about tree cores from the master chart. (Instructor will provide the diameter information.)

Tree No.	*No. dark rings from center to bark (approx. age)*	*Diameter of tree trunk (cir. ÷ 3)*	*No. dark rings in last inch*	*Remarks about the ring pattern*
1				
2				
3				
4				
5				
6				

Questions and discussion:

1. What similarities do you notice in the data about the trees?
2. What differences do you notice in the data about the trees?

TASK C: (Part 3: 20-30 minutes) Work in small groups.

Set up an investigation to find out the reasons for some of the differences in the data.

1. Select two or three trees from the list that show differences in growth rates.
2. Which trees did you select? (Indicate by number.) _____
3. Why did you select these trees? _____
   _____

Go with your group to the site of the trees you selected for investigation and do Part 4.

Part 4: (30-40 minutes) Work in small groups.

Collecting and Recording Data

Record your observations:

Interpreting Data

Record possible interpretations of the above data:

Summarizing Your Investigation

Write your group's summary below, including:

1. What you were trying to find out.
2. What data you collected about it.
3. What interpretations you made.
4. What other data you would collect about the investigation.

Questions and discussion:

1. Ask for two- or three-minute summaries from several groups.
2. What problems did you encounter in this task?
3. What other data could you collect about your investigation?
4. What does the information tell us about the past events of this environment?
5. How would you summarize the major factors affecting the growth of this forest?

III. INTERPRETING PAST EVENTS

Distribute Task D cards.

TASK D: (30-40 minutes)

Look for evidence of change, natural and man-made, in the environment. Record and fill out other columns.

Evidence of changes in the environment	*What might have caused them?*	*Effect on the environment*

Describe the way the area around you probably looked 25 years ago.

Describe how you think the area around you might look 25 years from now.

Questions and discussion:

1. What evidence of change did you find?
2. What might have caused this?
3. What was the effect of _____ (this change) on the environment? Allow

time for interchange of ideas among group members. The same changes may have been noticed, and there may be many interpretations of their causes and their effects.

4. What do you think this area looked like 25 years ago?
5. How do you think this area will look 25 years from now?

TASK E: (10 minutes)

Describe in writing how you feel about the changes in this environment.

IV. INFERRING CHANGES IN A ROTTEN LOG OR STUMP

Find a rotten stump or log.

Questions and discussion:

1. What things about this stump give us clues about the past events that have taken place?
2. What factors caused these things to happen?

Distribute Task F cards.

TASK F: (15-20 minutes) Work in groups or by yourself.

NOTE: *DO NOT TEAR THE STUMP APART! Discuss why.*

What things are changing the rotten stump now? Record below:

Living things	*Effect on stump*

Non-living things	*Effect on stump*

Questions and discussion:

1. What cycles are taking place in the rotten log or stump?
2. Construct a diagram of one of the cycles taking place in the rotten log or stump.

Distribute Task G cards.

TASK G: (15 minutes) Work in groups.

Construct a diagram of one of the cycles taking place in the rotten log or stump.

V. TRANSFERRING THE PROCESS TO OTHER ENVIRONMENTS

Questions and discussion:

1. What are some other things that could help us make further interpretations about this environment? List on board.
2. Using one of the items listed in Question 1 or any other topic you can think of, do Task H. Distribute task cards.

TASK II: (30 minutes)

Describe in writing an alternative activity you could have done to establish a time sequence for the past events in this environment.

Describe in writing an activity you could do in a *city environment* to establish a time sequence for the past events in the environment.

Activity	*What it would tell you about the past events in the area*

Describe an activity you could do in the area around your school to establish a time sequence for the past events in the area.

Activity	*What it would tell you about the past events in the area*

VI. COMMUNICATING FEELINGS OF AWARENESS THROUGH SKETCHING

Distribute sketching paper and pieces of charcoal from a campfire or fireplace.

TASK I: Give these directions verbally. No task card is required.

Construct a sketch using the charcoal. Other sketching materials will be given to you as you work.

Subject of sketch depends on the setting. It can be anything that is significant about the area; rotten log, stump or snag; an old homestead, fence or barn; a city building, transmission tower or freeway.

While people are sketching, go around and give them rotten wood (brown), dandelion leaves (green), dandelion flowers (yellow) and other natural materials in season. If you're not in the woods, *improvise!*

VII. COMMUNICATING FEELINGS OF AWARENESS AND VALUES THROUGH WRITING

Begin this part when about half the people finish their sketch.

TASK J: Give these directions verbally. No task card is required.

Use your pencil or pen. Find a place on your sketch (across the bottom or down the side) to write some things. Write two descriptive words about the stump (words that tell what it looks like). Write three action words about the stump (words that describe processes or changes taking place or things happening to it). Write a short phrase (4-5 words) that tells how the stump affects the rest of the environment (a phrase to describe its value or usefulness or a phrase describing *any* thought you have about the stump). Write one word that sums up everything about the stump (a word that suggests a comparison, an analogy or synonym). Optional: Now, if you wish, go back and give a title to what you have written. Congratulations. You have just written a poem in the form called cinquain.

Pace the preceding directions to the needs of the group. People shouldn't feel pressured while writing this – be casual. It's good to mention that they may not wish to write something for every direction that is given.
Review the directions now and then for people still thinking.
Have people read their poems if they wish.

In what ways does this description show your feelings and awareness of the environment?

Summary questions:

1. What did we find out about the environment in our session today? (List on chart, if time.)
2. Why are these things important to the way we manage the environment?
3. How can we summarize our discussion (or investigation)? (What are some big ideas that would sum up what we've just said?)
4. What methods and processes did we use in our investigations?

Distribute Task K cards.

TASK K:

Describe in writing how you feel about our session today.

Behavioral Outcomes in Knowledge

As a result of these activities, you should be able to:

List at least three observations about the cross-sections provided and give possible reasons for each observation.

Describe ways to set up an investigation to find out more about the above observations and inferences.
Set up an investigation (collect and record data) to find out reasons for growth rate differences in a given stand of trees.
Describe activities appropriate to other environments for interpreting the landscape.
Identify and list at least three evidences of change in the environment and infer the cause and effect relationships of those changes.
Construct a diagram of a natural cycle occurring in a rotten stump.

Behavioral Outcomes in Feelings, Awareness, Values and Action

As a result of these activities, you should be able to:
Describe how you feel about one change in this environment.
Communicate feelings of awareness by constructing a sketch of a given object in the environment, using natural materials.
Communicate feelings, awareness and values by describing in writing the effect of a given object on the environment.

Equipment Needed

30 cross-sections of trees
6 increment cores (preferably in plastic) from numbered trees
30 hand lenses (optional)
30 pieces sketching paper
Lab sheets
Task cards
Natural materials for sketching
Measuring tapes (cloth ones are satisfactory)

Land Use Simulation Game

Set the stage for this investigation by reviewing quickly what will take place in the allotted time. For example: "During this investigation we are going to participate in a simulation game concerning land use in a hypothetical community, analyze what we have done and present some ideas which will enable you to develop your own simulation game based on local environmental issues or concerns." The techniques used in simulation games combine elements of simulations, games and role-playing. Students assume the roles of decision-makers in a simulated environment and compete for certain objectives according to specified procedures and rules. (Note to teacher: Use as much of the information about simulation games included below as needed. This will depend on how familiar participants are with this type of activity.)

SOME INFORMATION ABOUT SIMULATION GAMES (Use as needed to set stage.)

Simulations are operating models of real life situations. They may be about physical or social situations. Most simulations for classroom use involve *role-playing* – the roles being acted out to correspond to the functioning of some real process or system. Most simulations for classroom use involve *gaming*. A game is defined as something enjoyable – however serious it might be – involving competition for specified objectives and observing rules. Some simulation games are based on environmental issues. What are some benefits of using simulation games as an instructional technique for investigating environmental problems?

- They're fun.
- They get people involved.
- They are a logistically easy way of helping to prepare people for becoming involved with solving environmental problems.
- People analyze cause and effect relationships of environmental issues.
- People are put in role-playing situations where they have to suggest alternative solutions to environmental concerns.
- People are forced to evaluate the consequence of decisions in discussion or on paper before these decisions are carried out in reality.
- People interact with each other in the *decision-making* process.

Simulation games not only develop understanding, awareness and concern about problems in the environment, they also help people develop skills they need for citizen action and involvement in environmental management.

Adapting Lesson Plan to Your School and Community

Name of Lesson: Land Use Simulation Game

Process Skills: Observing, role - playing, collecting, interpreting, investigating, inferring, communicating, predicting, measuring, recording, describing, (feelings, values, understandings), constructing, analyzing, group problem solving.

Suggested Grade Levels: 4-12. Each educator will need to adapt this material to individual and group needs.

Suggested Disciplines: Social Studies, Science, Mathematics, Health, Language Arts, Creative Arts,

Business. This activity involves students by utilizing process skills in a variety of disciplines to experience, understand or improve local environs.

Environmental Study Site: Classroom

Designing Additional Experiences: *Total Environment Education* (See resource list).

I. INFERRING, RECORDING AND CLASSIFYING POSSIBLE USES OF LAND

Distribute Task A on the Centerplace City Land Use Problem. The problem to be decided is what are some possible uses for the square mile (640 acres) of county farmland four miles northeast of the city. It is now available for the city's use.

TASK A: (10 minutes) Work by yourself.

Read the background information for Centerplace City and then list some possible uses of the vacant farmland.

"One square mile of unused county farmland four miles northeast of the city is now available for the city's use."

Background Information Sheet: Centerplace City

The population is 250,000 and rapidly increasing.

The city's boundaries are being extended, but the suburban fringe is expanding even more rapidly.

The rapid population growth is accompanied by demands for more housing, more jobs, additional city services and recreational areas.

The power for industrial uses, adequate public transportation and a skilled labor force are available.

The city is located near forests, which are to the north.

The land to the east is devoted mainly to farming.

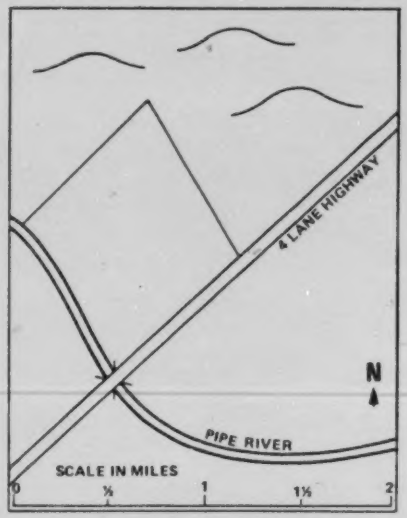
The Pipe River is unpolluted and is the source of irrigation water as well as the municipal water supply.

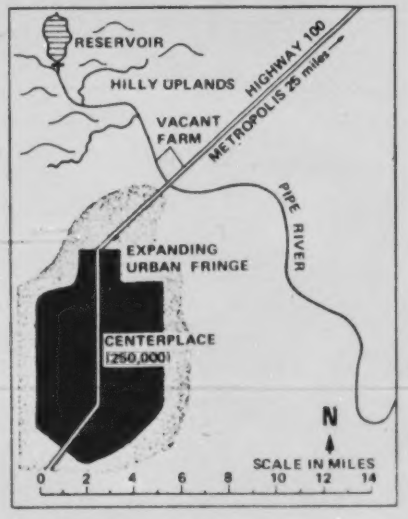
The river is too small for freight transportation, but logs could be floated on it.

The gravel bed of the river is appropriate raw material for concrete manufacture.

The present sewage treatment plant and garbage disposal area are at maximum capacity. The citizens of Centerplace are concerned about the maintenance of a scenic regional environment.

The County Board of Control is the authority for land zoning, and many citizens' groups are developing to influence zoning decisions.





List possible uses of the land below: _____

_____

_____

_____

_____

_____

_____

Questions and discussion:

NOTE: *When most people have started to write down uses for Task A, proceed with the following questions.*

1. What are some possible uses for the undeveloped land? As people respond, write all comments on the board just as they say them. Don't paraphrase for them unless they are too wordy, in which case, ask: "How shall I write that on the chart?" If they give major categories right away, such as recreation or industry, say, "Can you give me an example of that?" Number the items as you go along to simplify identification later. When you get 15 or 20 items, STOP.
2. "Which of these uses are similar?" Designate similar uses by letters – A for all of one type; B, the next, etc. When most are designated with a letter, or the group seems to run out of thoughts, STOP. It's okay to change the groupings if the students change their minds along the way in answering Question No. 2.
3. "What label could we give to all the items in A? What label could we give to Group B?", etc., e.g., Recreation, Industrial, Utilities, Housing, Commercial. It's okay if they suggest more than one label for a group; write them both down.

II. DEVELOPING AND GIVING PRESENTATIONS

1. Divide the class or group into the number of categories decided on in Question No. 3 above. There shouldn't be more than 6-10 in each group. Assign each group to one of the use categories.
2. Each group is to represent the special use group assigned.
3. Distribute Task B cards and inform the students that they have 10 minutes to list and analyze possible uses for the vacant land in the assigned category. They may consider those listed on the board in their category plus any other possible uses they can think of for the category.

TASK B: (10 minutes) Group No. _____ Assigned Category of Land Use _____

Your task is to analyze and list possible consequences of different land uses within your assigned land use category.

Use	*Advantages to land/people*	*Disadvantages to land/people*

At the end of 10 minutes, go on to Task C. You have 20 minutes to plan a strategy and develop a three-minute presentation to be made to the County Board of Commissioners.

a. This presentation will be a proposal for developing the undeveloped farmland.
b. You must have a visual display such as a land use map drawing as a part of your presentation.
c. More than one person in your group must help in making the presentation.

Distribute Task C cards.

TASK C: (20 minutes)

Develop a strategy and method to present your plan of development to the County Board of Commissioners or other appropriate local authority.

NOTE: *If possible, have a staff person assigned to each group to make written observations about how the group was able to work together to solve the problem.*

1. Ten minutes into Task C, have each group select one of its members to meet together as the County Board of Commissioners. Take the Board into another room, and tell them they will be responsible for hearing the presentations and deciding upon the best one. Their job in the next 10 minutes will be to:

   a. Develop the criteria they will use in evaluating the proposals.
   b. Develop some kind of matrix they can each use while the presentations are being given to record their evaluations.
   c. Elect a chairman to preside during group presentations.

CRITERIA

Presentation			

2. Twelve minutes after groups start planning Task C, remind them they have eight minutes left to have their verbal and visual presentations ready. Let groups have five more minutes to finish if needed.
3. Have Board of County Commissioners enter room and sit up front. Appoint a timekeeper to cut all presentations off at three minutes (give two-minute warning). Announce: "Because of time, there will be no rebuttals or discussion." The Board may want to ask questions or have rebuttal time after all presentations. However, allow only 5-10 minutes for this part so it won't get out of hand.
4. After No. 3 is finished, the Board retires for 5-10 minutes to select the best proposal.
5. While Board is meeting, each small group is to develop a list of criteria they think should be used in choosing one from among the plans submitted.
6. County Board of Commissioners announces its *decision* and gives reasons why.
7. County Board of Commissioners reads its criteria aloud.

Questions and discussion:

1. Did new leadership emerge during this session? What factors enabled this to happen? Call on staff observers if used.
2. Did your group work as a team? What did your group do to insure participation by all members of group?
3. What happened in the groups? How did you feel as a person? What about the criteria used? How did each observer see the interaction in the groups?
4. What additional data would you have liked to have had for your groups? List on board, e.g.: topography, vegetation, economy of area, railroad, shopping center, adjacent land, climate, soil survey, historical information, flood plain, wildlife, interest of board of control, money available, educational needs, state regulations, existing zoning, political climate, population information (age needs, race, jobs). What elements in the community discussion might support each interest?

NOTE: *This is one of the most important parts of the activity because it emphasizes that we need a variety of information and data before we can intelligently make a land management or environmental decision to best meet the needs of people and their environment. This question list has all the elements that need to be considered in studying a local environmental issue or concern. It also includes elements of all the curriculum subject areas (social studies, science, language, arts, etc.).*

III. ANALYZING CHARACTERISTICS OF SIMULATION

Questions and discussion:

1. One group of people working with simulation games has identified at least three basic characteristics of most simulation games:

   a. There is a problem to be solved.
   b. The factors affecting the decisions are identifiable.
   c. Groups or individuals with different interests who will be affected by the decision can be identified.

2. Let's see if the game we just played has these components.

   a. What was the clearly defined problem in the Land Use Alternatives Simulation?
   b. What factors influenced the decision in the Land Use Alternatives Simulation?
   c. We assigned groups to fit each role in the Land Use Alternatives Simulation, but we all helped develop those roles from the items we listed on the chart. What group or individual roles were identified? How were they identified?

IV. DEVELOPING YOUR OWN SIMULATION GAME (OPTIONAL)

The most exciting simulation games are those people develop themselves, based on local environmental issues in their community, state or region. Can you think of some current environmental issues in your community around which you could develop a game? Call for responses.

For the next 30 minutes you will work with one or two other people, developing the format for a simulation game based on a local land use issue described in a news article. (Have copies of current newspaper articles available if students want to use them.) Remember that three basic characteristics of a simulation game are:

1. There is a problem to be solved.
2. The factors affecting the decision are identifiable.
3. Groups and individuals with different interests affected by the decision can be identified.

At the end of that time, we would like to hear from several of you about what you have developed.

Distribute Task D cards.

TASK D: (30 minutes)

DEVELOPING A SIMULATION GAME

Work with one or two other people.

Using a newspaper article about a local environmental land use problem, develop the format of a simulation game considering the following items:

Identify the problem or issue to be decided upon.

Identify the choices available to the decision-makers.

Identify the factors having an influence on the decision.

Identify individual or group roles.

Identify the factors (for or against) assigned to each role.

Establish conditions for the players (i.e., resources, voting procedures, bargaining money, etc.).

Develop specific goals or objectives for the players.

Include limits or rules for what is permissible behavior (time factor, trading, number of points, money allocations, etc.).

Ask for reports from those who want to share.

Questions and discussion:

1. How can you use the techniques in this session in your job situation? Classroom?
2. How could a game like this develop decision-making skills in environmental management?
3. Have any of you used simulation games? Tell us about your experiences.
4. How can we take this process and use it to involve the public in social and political decision-making action projects in the community?
5. How can we summarize the use of simulation games in studies about the environment?
6. Which of the behavioral outcomes did we accomplish in this discussion? (Read and discuss.)

If the group is interested in further analysis of the elements of simulation, use the following:

1. One important characteristic of a simulation is a clearly defined problem, including the choices available to the decision-makers.

   a. How would you formulate the problem or issue you were asked to decide upon?
   b. Did the developer of this simulation simplify the choices?
   c. If so, how did he do it?

2. A second major characteristic of educational simulation is the factors having an influence on the decision. Several objective and subjective factors to be considered in making a decision need to be clearly identified. These factors indicate the data that is relevant to each of the possible choices.

   a. What factors were selected as influences on the decision?
   b. Which of these factors would you classify as objective?
   c. Which of these factors would you classify as subjective?

3. A third characteristic of educational simulations is the use of identifiable group or individual

roles to present information about the problem and many of the variables in the situation. Also, a role can be planned to incorporate a limited number of factors that influence the choice to be made.

a. What roles were identified?
b. What variables did these roles contribute to the decisions?
c. What additional roles could have been identified?

Distribute Task E cards.

TASK E:

Describe how you feel about our session today.

Have commercial games such as Dirty Water, Ecology, Coca Cola Game, Pollution, etc., on display if possible.

Behavioral Outcomes in Knowledge

As a result of this session you should be able to:

Identify and describe three component parts of simulation games.
Construct your own simulation game based on a current environmental issue.
Name and describe at least 10 important types of data needed before making a land management decision.
Identify cause and effect relationships that exist in environmental management.
Describe alternative solutions to solving specific problems.

Behavioral Outcomes in Feelings, Awareness, Values and Action

As a result of this session you should be able to:

Describe how the information in Question No. 3 above affects your life, community and the management of the environment.
Outline a plan of action to effect a solution or partial solution through the social and political decision-making process about the environmental issue you need in developing your own simulation.

Equipment Needed

Blackboard or easel
Chalk
Newsprint or butcher paper (enough for each group to make visual display)
Felt tip markers (four colors for each group to make visual display)
Masking tape
Task cards
Commercial games on display

The Centerplace City problem has been adapted with permission from the May, 1970, *Journal of Geography* from the article "A Land Use Alternatives Model for Upper Elementary Environmental Education" by Dennis Asmussen and Richard Cole, University of Washington.

References

There are many publications on simulation games. Two that may be of value to you are:

1. *Games in Geography*, Rex Walford, Longman Group Limited, London, paperback.
2. *Simulation Games for the Social Studies Classroom*, The Foreign Policy Association, 345 East 46th St., New York, N.Y. 10017; Library of Congress No. 68-24538.

Comparing Two Environments

It is exciting and important to make a comparison between two environments. This can provide an opportunity to explore the factors that allow for differences and likenesses in at least two parts of our total environment.

Adapting Lesson Plan to Your School and Community

Name of Lesson: Comparing Two Environments

Process Skills: Observing, collecting, interpreting, investigating, inferring, communicating, predicting, measuring, recording, describing, constructing.

Suggested Grade Levels: 4-12. Each educator will need to adapt this material to individual and group needs.

Suggested Disciplines: Science, Social Studies, Language Arts, Creative Arts, Health, Mathematics. This interdisciplinary activity involves students by utilizing process skills and several disciplines to experience, understand or improve local environs.

Environmental Study Sites: This lesson plan can be used in a rural, suburban or urban environment such as a forest, shopping center, housing project, industrial site, forum, park, etc.

Designing Additional Experiences: *Total Environment Education* (See resource list)

I. SUMMARIZING EACH ENVIRONMENT

After an in-depth study of two different environments, have small groups do Task A.

NOTE: *An in-depth study of a forest environment might include the investigation of land use planning, measuring some water quality criteria, and investigating a forest environment and environmental habitats. An in-depth study of an urban environment might include the investigations of land use planning, water quality criteria and urban surroundings.*

Distribute Task A cards.

TASK A: (15 minutes) Work in small groups.

Analyze the data collected for each environment and do the following:

1. List four things you found out about _____ environment.

   1.

   2.

   3.

4.

2. List four things you found out about _____ environment.

1.

2.

3.

4.

Questions and discussion:

1. List and group items on board.
2. Which things are similar in each environment?
3. Why do you think this is so?
4. Which things are different?
5. Why do you think this is so?

Distribute Task B cards.

TASK B: (15 minutes) Small groups.

List at least four basic functions of each environment.

_____ environment _____ environment

1.

2.

3.

4.

Distribute Task C cards.

TASK C: (15 minutes) Small groups.

List three factors that affect the quality of two environments.

_____ environment	_____ environment
1.	1.
2.	2.
3.	3.

Questions and discussion:

1. Discuss the results of Tasks B and C with the group and list on board next to Task A results.
2. In what way, if any, will the environmental settings have an affect on each other?
3. Based on your own investigations, what are some general factors that apply to both environments?
4. Summarize the unique contribution of each area to society.

Distribute Task D cards.

TASK D: (15 minutes) Small groups.

List at least four of the most obvious problems of the two environments.

_____ environment	_____ environment
1.	
2.	
3.	
4.	

Distribute Task E cards.

TASK E: (20 minutes)

List at least four guidelines that you would use in planning for future land uses in both environments.

1. _____ environment

2. _____ environment

Distribute Task F cards.

TASK F:

What can we say about environments?

Behavioral Outcomes in Knowledge

After this session you should be able to:

Identify four basic functions about each environment.
Describe three ways in which the environments are interrelated.
Identify three factors common to both environments.
Describe three similarities and differences between each environment.

Behavioral Outcomes in Attitudes, Awareness, Values and Action

Describe at least two unique contributions that each environment makes to society.
Identify at least three guidelines that you would use in planning for management of the environments.
Describe how you feel about man's use of each environment.
Describe your recommendations for the future management of the area.

Investigating an Urban Environment

Set the stage for this investigation by reviewing quickly what will take place in the allotted time. For example: During this session we want to investigate an urban environment and collect information that will tell us about the livability, functions, needs and problems of this community. In addition to finding out about this community, you will be developing procedures you can use with your students to investigate your own community.

Adapting Lesson Plan to Your School and Community

Name of Lesson: Investigating an Urban Environment

Process Skills: Observing, collecting, interpreting, investigating, inferring, communicating, predicting, measuring, recording, describing, constructing, reporting, analyzing.

Suggested Grade Levels: 4-12. Each educator will need to adapt this material to individual and group needs.

Suggested Disciplines: Social Studies, Science, Language Arts, Creative Arts, Health, Mathematics. This activity involves students by utilizing process skills in a variety of disciplines to experience, understand or improve local environs.

Environmental Study Sites: This lesson plan can best be used in an urban environment such as a housing area, commercial district, industrial area, neighborhood community, school community, shopping area, congested area, park or watershed.

Designing Additional Experiences: *Total Environment Education* (See resource list)

I. IDENTIFYING COMPONENT PARTS OF AN URBAN ENVIRONMENT

1. Distribute a copy of a map of the urban area you want to investigate to each person. Have it large enough to make notes on when in the field.
2. Working in small groups, list as many things as you can think of that might affect the quality of the environment in this community.

Distribute Task A cards.

TASK A: (20 minutes) Work in groups of five or six.

List some things that might affect the quality of the environment in this community. Use map or past knowledge of area. Group items by categories and label categories.

Questions and discussion:

1. What categories did you come up with? List on board just as groups report (e.g., human factors, land use, transportation, community facilities, etc.). If group lists individual items in the community, you may have to group and label into large categories (housing, commercial, utilities, transportation, land, etc.).
2. What criteria would you use in selecting an area of this community to study?
3. Have each group spend 10-15 minutes drawing boundary lines around an area they decide to investigate. Use map passed out at first.
4. What could you do in this community to collect first-hand information about each of the categories decided upon?

II. CONSTRUCTING AND DEVELOPING AN INVESTIGATION

Distribute Task B cards.

TASK B: (60 minutes)

Develop a plan of action to investigate the part of the community chosen. Consider such things as how to divide responsibility for collecting information; what information to collect; whether the group will stay together or split up; the most efficient ways to collect and record information, and the tools needed to record information.

NOTE: *Information in Task B should show relationships between items from the inventory, cause and effect relationships, conflicts and complements and specifics or details which help explain or clarify a relationship. Methods include questioning, opinion polls from residents, user counts of facilities, traffic counts and maps in great detail.*

Ask each group to report briefly on the procedures they have developed for the planned investigation of the _____ community.

III. COLLECTING, RECORDING AND REPORTING SURVEY INFORMATION

Distribute Task C cards.

TASK C: (3-4 hours) Field investigation.

Each group should spend three to four hours to do a visual survey and investigation of that portion of the community decided upon, using the methods of collecting, recording and interpreting data

each group developed.

Distribute Task D cards.

TASK D: (5 minutes for each group) After return from field investigation.

Plan a five-minute report that describes the methods used and the information collected in Task C. The report must use the following criteria:

a. Use more than one person as spokesman.
b. Use visual displays.
c. Include a variety of information media and methods of getting it.
d. Five-minute time limit.
e. Consider what you did, how you did it and what it meant.

Questions and discussion:

1. What are some component parts of the environment that you just investigated, e.g., roads, homes, businesses, rivers and recreational areas? List on board.
2. In what ways are the component parts interrelated, e.g., transportation to business, buildings to public utilities, transportation to land forms, strip city development to transportation, etc.?
3. How does each part of the investigated community relate to the other areas? To the total community?
4. What would happen if one whole segment of the community were eliminated? One category?
5. What examples are there in your area that illustrate the past, typify the present and indicate the future.
6. What are your recommendations for meeting future needs in this area?
7. If you were the city planning commission, what guidelines would you develop for consideration of future developments in this area?
8. Identify three factors that affect the quality of your area.

IV. IDENTIFYING AND CONSTRUCTING AN INVESTIGATION OF ONE ENVIRONMENTAL PROBLEM

Let's take an example of one interrelationship and investigate one segment of it.

NOTE: *Pick one example, such as transportation and traffic congestion, and have group list items*

under the following three columns, one column at a time.

What we want to find out about the interrelationship	*How to collect the information*	*How to record information*
How many cars?	Survey-visual count	Graph
Where do they go?	Questionnaire	Description
Where do they come from?	Questionnaire	Map location

Distribute Task E cards.

TASK E: (30 minutes) Work in original small groups.

Select one interrelationship or problem that you identified and develop an in-depth investigation to find out more about it. Consider: What you need to find out – actual samples of how to collect and record information, cause and effect relationships involved, alternative solutions to the problem, where to collect additional data and what social and political decision-making processes are available.

NOTE: *If this whole lesson is done over an extended period of time, each group should be allowed to carry out its investigation.*

Questions and discussion:

1. Have each group make a report covering points in Task E.
2. Now that we know more about the _____ community, do Task F. Distribute task cards.

TASK F: (15 minutes) Small groups.

List what you can say about your study area in relation to its past, present and future regarding:

Functions	*Problems*	*Needs*

Questions:

1. What are the basic functions of your study area? Whole community?
2. What are some of the most obvious problems?
3. What are some of the needs of the study area?
4. Identify three factors that affect the quality of the environment in the area studied.
5. What impact does this survey area have on the management of the community?
6. What additional information would you like to have had before making a decision?

V. COMMUNICATING FEELINGS, AWARENESS AND VALUES

Distribute Task G cards.

TASK G:

Describe what you would do to solve or improve the problem you identified in Task E as a member of a community action group or as a part of the political decision-making process in your community.

Questions and discussion:

1. Discuss individual comments.
2. What type of community action can we take to identify and motivate people to collect and interpret data, arrive at alternative solutions and take intelligent action to decide on the best solution consistent with the needs of the environment and society?

Summary questions:

1. What did we find out about the environment in our study?
2. How can we summarize our discussion and investigations?
3. What processes and methods did we use in our investigation today?

Distribute Task H cards.

TASK H:

Describe in writing how you feel about our session today.

MICRO-URBAN INVESTIGATIONS (OPTIONAL)

In addition to major component parts or categories of an urban environment, there are many opportunities for small individual environmental investigations. Investigations of this nature should be developed in writing along the same procedures as in Tasks B, C or E.

Distribute Task I cards.

TASK I:

Develop in writing an investigation about some part of the man-made environment. Describe procedures for conducting the investigation in action or process terms and state objectives in behavioral outcomes that indicate some minimal expectations in acquiring new knowledge and skills.

Here are some suggested micro-urban environmental investigations:

1. Correlate observable weather conditions to air pollution index.
2. Correlate man-made sounds to noise pollution.
3. Describe effect of signs and billboards on sight pollution.
4. Describe effect of architecture on aesthetics.
5. Describe impact of local shopping center on community.
6. Conduct a supermarket survey (packaging, buying habits).
7. Interpret the man-made landscape using architectural styles, etc.
8. Observe and record life in a park.
9. Explain man's effect on watersheds through paving.
10. Explain under what conditions plant life can live in a blacktop environment.
11. Compare a downtown city block to a residential block.
12. Determine the effect of different types of man-made surfaces on water holding capacity and runoff.
13. Determine the environment of a city tree.
14. Determine what is in a city block.
15. Noise pollution – determine where noises occur most frequently and which city noises could be reduced to minimize noise pollution.
16. Give an analysis of traffic past a predetermined point.
17. Inventory and classify historic structures within the central business district of your hometown and determine necessities for their protection.
18. Describe the effect of a four-day work week on the community environment.
19. Does storm runoff from city streets contribute to water pollution?
20. Identify factors and develop tools to help in recording and interpreting air pollution indexes in the local community.

Behavioral Outcomes in Knowledge

As a result of these activities, you should be able to:

Identify at least three factors that affect the quality of the environment.

Describe a procedure to use in initiating an environmental investigation that can take place in any urban environment.

Identify at least three component parts of an urban environment.
Describe four interrelationships that exist between component parts of the environment.

Behavioral Outcomes in Feelings, Awareness, Values and Action

As a result of these activities, you should be able to:
Describe what you can do to become involved in community action programs that identify and suggest solutions to local environmental problems.
Describe how you and other people in the community can become involved in affecting the local political decision-making process through environmental urban investigations.
Analyze the cause and effect relationship of factors affecting the quality of the environment. This is prerequisite to any positive change.
Identify forces and change agents that can be used for or against an improved livability of the area.

Equipment Needed

Enlarged maps of the urban area to be investigated, blackboard or newsprint easel, felt tip markers or chalk and paper and pencils.

Additional Information

The following work sheets could be used to provide additional information to people investigating an urban environment after they have completed Tasks A, B and C. The group may identify different component parts of the environment than those listed here.

LAND USE SURVEY WORK SHEET

1. *Inventory and Plot on Map*

List the major uses of land in the area under study.
Group those uses into appropriate categories.
Label the categories.
Develop a legend for plotting this data on the map.

2. *Additional Information*

Devise your own methods to collect and record data. Submit written summaries of the methods and data to your group leader.

How does each land use affect the other land uses of the area?
What problems exist because of certain land uses?
What land use problems in this area are related to regional (e.g., Portland metropolitan area, San Francisco Bay area, Atlanta metropolitan) environmental problems?
What things are being done to the land that are compatible with the characteristics of the land and the needs of the people?
Which land uses are changing?
What proposed projects could affect land use patterns in this area?

NOTE — The above questions are designed to help you look for significant relationships between things in the environment. Time may not allow you to investigate all of the suggestions. You will, therefore, have to decide which things are most significant in the time allowed. Feel free to add to the list or change it as needed.

Something To Think About

For each of the land uses you investigate, ask yourself:
Is it in a good location to serve its purpose?
What does it do to the environment?
What kind of an environment does it have?

3. *Summary Questions on Land Use Survey*

See questions and discussions after Task D.

TRAFFIC AND TRANSPORTATION SURVEY WORK SHEET

1. *Inventory and Plot on Map*

List the major traffic routes in the area.
Group these routes into appropriate categories.
Label the categories.
Develop a legend for plotting this data on the map.

2. *Additional Information*

Devise your own methods to collect and record data. Submit written summaries of the methods and data to your group leader.

List the major user groups of each category listed in Question 1 above.
Which are the most heavily traveled routes?
What problems are associated with traffic and transportation in the area?
What is the effect of these problems on the rest of the study area?
What traffic and transportation problems associated with this area are related to regional (e.g., Portland metropolitan area) environmental problems?
What proposed projects could affect traffic and transportation patterns in the area?

NOTE: The above questions are designed to help you look for significant relationships between things in the environment. Time may not allow you to investigate all of the suggestions. You will, therefore, have to decide which things are most significant in the time allowed. Feel free to add to the list or change it as needed.

Something to Think About

For each of the traffic and transportation routes you investigate, ask yourself:

Is it in a good location to serve its purpose?
What does it do to the environment?
What kind of an environment does it have?

3. *Summary Question on Traffic and Transportation Survey*

See questions and discussions after Task D.

COMMUNITY FACILITIES AND SERVICES SURVEY WORK SHEET

1. *Inventory and Plot on Map*

List the community facilities and services in this area.
Group these facilities and services into appropriate categories.
Label the categories.
Develop a legend for plotting this data on the map.

2. *Additional Information*

Devise your own methods to collect and record data. Submit written summaries of the methods and data to your group leader.

List the user groups for each category in Question 1 above.
What reasons can you give for the locations of each of the community facilities and services listed?
What needs of the people are being met by these facilities and services?
What needs are not being met by existing facilities and services?
What problems are associated with the quantity and quality of community facilities and services in this area?
Which of these problems are related to regional (e.g., Portland metropolitan area) environmental problems?
What proposed projects could affect the use and effectiveness of community facilities and services in this area?

NOTE: The above questions are designed to help you look for significant relationships between things in the environment. Time may not allow you to investigate all of the suggestions. You will, therefore, have to decide which things are most significant in the time allowed. Feel free to add to the list or change it as needed.

Something to Think About

For each of the community facilities and services you investigate, ask yourself:

Is it in a good location to serve its purpose?
What does it do to the environment?
What kind of an environment does it have?

3. *Summary Questions on Community Facilities and Services*

See questions and discussion after Task D.

ENVIRONMENTAL ASSETS AND LIABILITIES SURVEY WORK SHEET

1. *Inventory and Plot on Map*

List the environmental assets of the area (physical and visual).
Examples: Historic landmarks, structures with visual impact, natural features and aesthetically pleasing entrances.

List the environmental liabilities of the area (physical and visual).
Examples: Conflicting land uses, heavy traffic streets, residential overcrowding, poor paving, curbs, sidewalks, adverse natural features and sameness of environment.

Group the environmental assets and liabilities into appropriate categories. Label the categories. Develop a legend for plotting this data on the map.

2. *Additional Information*

Devise your own methods to collect and record data. Submit written summaries of the methods and data to your group leader.

How do the environmental assets affect the rest of the area? Be specific.
How do the environmental liabilities affect the rest of the area? Be specific.
Which environmental assets have potential for serving as building blocks to improve the livability of this area?
What problems exist because of adverse environmental factors in the area?
What environmental problems in this area are related to regional (e.g., Portland metropolitan area) environmental problems?
What proposed projects could affect environmental assets and liabilities in this area?

NOTE: The above questions are designed to help you look for significant relationships between things in the environment. Time may not allow you to investigate all of the suggestions. You will, therefore, have to decide which things are most significant in the time allowed. Feel free to add to the list or change it as needed.

Something to Think About

For each of the environmental assets and liabilities you investigate, ask yourself:

Is it in a good location to serve its purpose?
What does it do to the environment?
What kind of an environment does it have?

3. *Summary Questions on Environmental Assets and Liabilities*

See questions and discussions after Task D.

SOCIAL SURVEY WORK SHEET

1. *Inventory and Plot on Map*

Collect information about the population characteristics of the area, e.g., age, income, education, size of families, renters-owners and length of residence.
Develop a legend for plotting this data on the map.

2. *Additional Information*

Devise your own methods to collect and record data. Submit written summaries of the methods and data to your group leader.

What needs of the residents are met by living in this area?
What social problems exist in the area?
Which problems associated with this area are related to regional (e.g., Portland metropolitan area) environmental problems?
What changing conditions in the area are creating problems for its residents?
What proposed projects could:
affect the life-style of people in this area?
lead to a change in the population characteristics of this area?
What are the attitudes of the people in this area toward governmental and private services,

citizen needs and overall quality of life in the area? See attached opinion poll.

NOTE: *The above questions are designed to help you look for significant relationships between things in the environment. Time may not allow you to investigate all of the suggestions. You will therefore have to decide which things are most significant in the time allowed. Please feel free to add to the list or change it as needed.*

3. *Summary Questions on Social Survey*

See questions and discussions after Task D.

SOCIAL SURVEY QUESTIONNAIRE

NOTE: *Fill in the blanks with appropriate words, depending on the location and purposes for which you are using the questionnaire.*

1. I live in _____ at (cross-streets) _____

2. Overall, _____ (shop) as a place to (live) is:

☐ VERY GOOD ☐ QUITE GOOD ☐ JUST FAIR ☐ POOR ☐ VERY POOR

3. What I like best about _____ is:

4. My biggest complaint about _____ is:

5. Here's what I think should be done about that:

Outline for Investigating Snow

Set the tone for this investigation by reviewing the tasks that will be covered in the allotted time. Example: In the next three hours the class will investigate the impact of snow on wildlife, water and trees. Students will check insulation qualities of snow, infer temperature, as well as 0_2 and pH content in snow as opposed to a stream nearby. Class members will measure the H_2O potential of the snow and discuss its ecological, social and political impact. Please check behavioral objective at end of the lesson to facilitate evaluation of this session. Show the Hach Kit to the group.

Adapting Lesson Plan to Your School and Community

Name of Lesson: Investigating Snow

Process Skills: Observing, collecting, interpreting, investigating, inferring, communicating, testing, predicting, measuring, recording, describing, constructing, reporting, analyzing.

Suggested Grade Levels: 4-12. Each educator will need to adapt this material to individual and group needs.

Suggested Disciplines: Social Studies, Science, Language Arts, Creative Arts, Mathematics, Health. This activity involves students by utilizing process skills in a variety of disciplines to experience, understand and improve local environs.

Environmental Study Sites: This lesson plan can be used in a rural, suburban or urban environment such as a school ground, empty lot, park, forest, yard, nature center or wildlife area.

Designing Additional Experiences: *Total Environment Education* (see resource list)

I. OBSERVING THE SNOW ENVIRONMENT

Assign Task A for recording observations of the snow. Walk to assigned investigation areas.

TASK A: (10-15 minutes) Work by yourself or in small groups.

While walking to a specific vantage point, make observations and written or verbal reports of the influence of snow on:

Plants _____

Animals _____

Air _____

Water _____

Questions and discussion: (10 minutes)

1. What was noticed about the snow?
2. What was noticed about the snow around the base of large trees?
3. What tree types have been affected most by the snow?
4. What effect does the snow have on the lake (stream)?

II. OBSERVING AND RECORDING ANIMAL HABITATS

Questions and discussion: (10 minutes)

1. What animals would one expect to find living in this area now?
2. What are the needs of these animals?
3. Where would one look for animals around here?
4. What are some of the different kinds of habitat available for wildlife in this area?

TASK B: (10 minutes) Work in small groups.

Explore as many places (environments or habitats) as possible and record either observations of animals or sightings of their traces. Look for and list the animal signs (partly consumed foods, scats, homes, bird nests, feathers, etc.).

Questions and discussion:

1. How many habitats did you find?
2. What factors made one habitat more desirable than another?
3. How does the impact of man's activities compare with the impact of other animals?
4. How can we summarize the effect of snow on animal habitats?

TASK C: (20 minutes)

I. COMPUTING THE WATER CONTENT OF SNOW

Instructions for collecting and recording water equivalents of snow.

a. Measure snow depth in six random on-site locations. Be sure to select areas where there is little drifting and no man-made tracks. Record the depth at each location, compute the total and divide by the number of measurements to compute *average snow depth*.

Sum of measurements / No. of measurements 6 = _____ Average snow depth in inches

An acre-foot is one acre (43,560 sq. ft.) of water, one foot deep, containing 325,000 gallons. An

acre-inch equals approximately 27,000 gallons of H_2O.

b. Find the water volume content of the snow per acre.

_____	÷	10	=	_____
(average depth of snow)		(inches)		(no. of inches of H_2O)

For this problem use the H_2O equivalent of snow 1:10. One inch of H_2O equals 10 inches of snow.

c. If all of it could be captured, amount of H_2O on site.

_____	x	27,000	x	_____	=	_____
(No. of inches of H_2O)		(H_2O in 1 acre-inch)		(acreage) **		(gals. of H_2O on site)

**Acreage or fractions of acre information should be made available to group.

d. Find how many people could be supported by the H_2O equivalent of snow on the site.

_____	÷	200	=	_____
(gals. of H_2O on site)		(ave. daily H_2O needs)		(people supported)

II. MEASURING AND RECORDING SNOW CHARACTERISTICS TO TEST PREDICTIONS

TASK D: (10 minutes) Work by yourself.

On this site the predicted air temperature will be _____ because _____

the snow temperature at 1/3 depth will be _____ because

_____

the snow temperature at 2/3 depth will be _____ because

_____

the ground surface temperature will be _____ because

_____

the pH of the melted snow will be _____ because

_____

the dissolved O_2 count will be _____ because _____

Keep these predictions for reference.

NOTE: *The pH and dissolved O_2 need to be tested at a nearby water source and the results distributed prior to starting Task D.*

Questions and discussion:

1. As a group discuss the range of predictions.
2. What criteria did you use to arrive at your predictions?
3. How can we test out our predictions?

III. VERIFYING PREDICTIONS

Directions to groups: Test the predictions just made by using the Hach O_2 pH Testing Kit (instructions are inside the lid). There are several jobs to be done in testing. Part of the group should be assigned to take the collected snow samples back for melting and testing.

NOTE: *It is not necessary to demonstrate the use of the kit. Let group do it.*

Thermometers, yardsticks, cans, snow shovels are needed to complete Task E.

TASK E: (20 minutes) Work in small groups (4 to 6 people). Make sure everyone in the group gets involved in the testing.

Location	*Time*	*Temperature*						*pH*		*Dissolved Water Content*			
		Air		*Snow*		*Ground*				*O_2 (ppm)*		*(gals.)*	
		Prediction	*Actual Test*	*Prediction*	*Actual Test*	*Prediction*	*Actual Test*	*Prediction*	*Actual Test*	*Prediction*	*Actual Test*	*Prediction*	*Actual Test*
				1/3									
				2/3									

1. *Insulation* – As snow compacts, its insulation ability is altered. Using the thermometer, take temperature readings at the following points: (a) 3 feet above snow, (b) 1/3 depth, (c) 2/3 depth, (d) and ground surface.
2. *Depth of Snow* – Using your yardstick as a measuring device, compute the average of six measurements at various locations.
3. *Water Content* – Compacted snow will contain more water per unit of volume. To determine H_2O content, take a coffee can and shove it into the snow until the snow is level with the rim of the can. After cutting the snow away along the lower rim, take several samples of compact and noncompact snow and put them in plastic bags. Take the plastic bags back to be melted and tested for pH and O_2 content.

Questions and discussion:

Have each group report the results of their tests to the entire group. Compare results.

1. What might account for any differences in results from each group?
2. How did test results compare to predictions?
3. Is it necessary to have sophisticated equipment to determine temperature, O_2, pH, etc.?
4. Under what conditions might we expect to get different test results than we did today?

5. If we took the temperature depth of snow at base of hill, what difference might we find?
6. Could we predict frost depth in the soil from our current information?
7. If a quick thaw occurred, what factors would influence runoff rates?

IV. COMMUNICATING FEELINGS, AWARENESS AND VALUES ABOUT SNOW

Question and discussion:

Is snow good or bad?

TASK F: (10 minutes) Work by yourself.

1. Describe in sentences your feelings about snow.

2. Describe in three sentences how you generally feel toward snow.

3. List your feeling about snow in the various categories.

   a. Ecological
   b. Social
   c. Psychological
   d. Economical

Summary Questions:

1. What did you find out about snow from the day's investigations?
2. What effect does snow have on other resources?
3. How can today's discussions and investigations be summarized?
4. What methods and processes were used in today's investigation?

Behavioral Outcomes in Knowledge

As a result of the investigation, you should be able to:

Demonstrate the ability to test out predictions about snow as relates to pH, O_2 and temperature by using several items such as water kit and thermometer.
Measure a volume of snow and determine the water content and number of people it would support.
Measure the insulation properties of snow at several layers.

Behavioral Outcomes in Feelings, Awareness, Values and Action

As a result of the activities, you should be able to:

Describe in writing how you feel about snow in several situations.
Communicate feelings, awareness and values of snow.

Equipment Needed (for a class of 30 students)

4 water testing kits
4 thermometers
4 snow shovels
8 coffee cans
8 yardsticks
8 large plastic bags
30 lesson plans
Felt tip pens and chart paper

It is suggested that continuous revision and refinements be made by students using the lesson to meet their specific needs.

NOTE: *This lesson plan was developed for use in teacher workshops by John M. Pager, Milwaukee, Wisconsin, with ideas from Rod Smith, Lansing, Michigan, January, 1973.*

Investigating the Effects of Fire on the Forest Environment

Set the parameters for this investigation by reviewing quickly what will be covered in the allotted time. Each task takes approximately one hour to complete.

This lesson plan will help sharpen powers of observation, ability to predict and infer effects of fire, as well as explore the feelings and current thinking about fire and how it relates to other forest conditions.

Adapting Lesson Plan to Your School and Community

Name of Lesson: Investigating the Effects of Fire on the Forest Environment

Process Skills: Observing, inferring, predicting, collecting, measuring, interpreting, analyzing, communicating, describing, investigating, exploring, recording, describing.

Suggested Grade Levels: 4-12. Each educator will need to adapt this material to individual and group needs.

Suggested Disciplines: Social Studies, Mathematics, Science, Language Arts, Creative Arts. This activity involves students by utilizing process skills in a variety of disciplines to experience, understand or improve local environs.

Environmental Study Sites: This lesson plan can best be used in a rural environment such as a private, state or national forest.

Designing Additional Experiences: *Total Environment Education* (see resource list)

I. OBSERVING AND INFERRING EFFECTS OF FIRE

Take the group to a recently burned area. Distribute Task A cards.

TASK A: (20-25 minutes) Work in groups of 5 to 6 persons.

Look over the area. Record your observations about the effects of fire on the following resources: (Pass out hand lenses)

Resources	*Observations (what you noticed)*	*Inferences (possible reasons)*
1. Cover (trees, plants)		
2. Wildlife		
3. Soil		
4. H_2O		
5. Aesthetics		

NOTE: *Instructor may need to ask several focusing questions to have the group discuss effects of fire on all resources.*

Questions and discussion:

1. What did you see?
2. What effect does the size of plant materials (fuel) have on the way a fire burns?
3. How did this fire (burn) compare to other fires?
4. In your opinion, which of the resources were most affected by this fire?
5. Were there any beneficial effects? Under what conditions, could there have been?
6. Is fire a natural phenomenon (happening) in a forest environment? Explain.

II. COLLECTING, MEASURING AND INTERPRETING DATA ABOUT THE FIRE

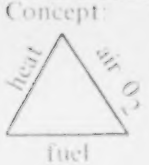
TASK B: (20-25 minutes) Work in small groups.

1. Draw a map of the fire. Show as many key features as observed – slope, roads, streams, vegetation, etc.
2. Show on the map where and why the fire stopped, and where it started.
3. Distribute Task B cards.

Questions and discussion:

1. What did the fire burn?
2. What influenced the shape of the fire?
3. What caused the fire to stop burning?
4. Did the fire burn "hotter" some places than others? Why?
5. What effects will removal of any one of the three elements have on the fire?
6. As a result of our discussion, three things keep cropping up; what elements were necessary for this or any other fire to burn?
7. If you were the boss of the fire fighters, how would you have fought this fire?

Important Concept:

The 

should be the culminating concept in this task. At some point in time, the diagram of a should be constructed as the groups respond.

III. IDENTIFYING AND PREDICTING USES OF VARIOUS FIRE SUPPRESSION TOOLS

TASK C: (15-20 minutes) Work in groups of 5 or 6 persons.

Examine the various fire fighting equipment. Describe which element(s) of the fire triangle the tool could be used against and how.

1. Backpack Pump
2. Cutting Tools – Axes, Pulaski, Council
3. Scraping Tools – Broom, Rakes, Shovels, McLeod
4. Power Chain Saw
5. Drip Torch – Fusee

If available, demonstrate fire plow and bulldozer.

NOTE: *Have one sample of each tool available for each team to examine and discuss their uses and relative merits in fighting fires.*

Fuel	*Heat*	*Air (0_2)*
1.		
2.		
3.		

Questions and discussion:

1. Why were these specific tools picked for fire suppression?
2. How would a team use them in suppression?
3. What physical features might influence the choice of tools to be used?
4. Which tools – and in what order – would you use in this area?
5. To summarize discussion, how are the fire elements and tools related?

IV. OBSERVING AND ANALYZING CHARACTERISTICS OF SAFETY AND FIRE

Task D is optional and can be deleted if time is a factor.

TASK D: (Part I – Safety) (10-15 minutes) Work in a group of 5 to 6 persons.

1. Examine the tools and list the hazards and possible steps to be considered to prevent people from getting hurt, including other fire fighters.
2. Consider both use and transportation of tools. Have teams list their ideas.

Questions and discussion:

1. What dangers would occur in use of these tools?
2. Are there any tools that aren't hazardous?
3. What should we consider as relates to spacing of workers?
4. In your opinion, what physical features in this area should be considered in tool selection?

NOTE: *Discussion leader should watch closely for hazardous situations and correct flagrant violations.*

TASK D: (Part II – Simulated Fire, 15-20 minutes) Work in a group of 5 to 6 persons.

NOTE: *The following should be done before the group gets to the simulation area.*

1. Perimeter of fire defined by flagging or string.
2. Use terrain and cover typical of the geographical area.
3. If possible, use elongated shape approximately 20 to 40 meters.
4. Provide a variety of tools for each group (possibly leave a specific one out to prove a point).
5. Remind the group about spacing and safety.
6. Obtain the local weather forecast and report it to the groups.
7. Allot the group five minutes to plan strategy.
8. Give the group 15 minutes to build a fire line.

If confusion develops in Item 8, during critique draw out the concept that fire fighting is a science.

Questions and discussion:

1. How did you determine the method to attack the fire and the places to start?
2. What was the significance of the weather report? How did your strategy relate to the concept.
3. What factors could change which would require a different attack strategy? Why?
4. What factors should the fire boss consider and check before committing his crew?
5. What factors should be considered before the fire crew leave?
6. Did you observe hazardous use of tools? Explain.
7. How would you summarize our discussion about safety, selection and use of fire fighting tools and attack techniques?

V. COMMUNICATING FEELINGS OF AWARENESS AND VALUES OF FIRE

TASK E: (Part I – Prescribed Burn and Fire, 15-20 minutes) Work in groups of 5 to 6 persons.

Wildfire: An unplanned forest or range fire requiring vigorous suppression action.

Prescribed burn: Deliberate and skillful application of fire to natural fuel under carefully prescribed conditions to accomplish certain planned benefits.

Prescribed fire: An unplanned fire occurring in an area where a carefully prepared prescription requires modified suppression action to accomplish certain planned benefits.

Set the stage for this task by developing a definition of three words with the groups.

1. Prescribed burn
2. Prescribed fire

3. Wildfire

The groups are to analyze and list possible consequences of the three types of fire.

Fire type	*Advantages to resources*	*Disadvantages to resources*
Prescribed Burn		
Prescribed Fire		
Wildfire		

Each *team* should prepare a one-line statement for group presentation that denotes ideas on each fire type.

TASK E: (Part II — Feelings About Fire, 5-10 minutes) Work by yourself.

As a result of all our discussions, write a description of fire using the outline listed:

1. Use two words to describe it.
2. Three action words about what it does.
3. A four-word phrase to describe your feeling about it.
4. One word which summarizes your philosophy about fire.

NOTE: *Pacing is very important in this task. Ask for volunteers to share their ideas. Use a casual approach. You are dealing with values, and participants should feel free to express their feelings. After the group has shared their ideas and feelings, offer congratulations and inform them that they have just had their first reading as poets. In writing about fire in this way, they have written a form of poetry, cinquain (sin-kane).*

Questions and discussion:

1. What did we find about fire in our discussions? (Make a list, if time and chart are available.)
2. What place does fire prevention have in your everyday life?
3. How can we summarize our discussion about fire?
4. Have your feelings changed toward fire as a result of the investigations?

TASK F:

Describe in writing how you feel about the session today.

If the lesson plan is divided into two sessions, get an evaluation at the end of each segment.

Behavioral Outcomes in Knowledge

As a result of these activities, participants should be able to:

List both beneficial and harmful effects of fire on resources.
Identify tools and safety measures to remember and use in fire suppression.
Set up an investigation (analyze and interpret data) related to past fires.
Draw a simple sketch (map) that takes in the physical features related to fire.
Describe the triangle theory and the relation to fire and suppression.

Behavioral Outcomes in Feelings, Awareness, Values and Action

As a result of the fire investigation, participants should be able to:

Describe how you feel about fire's effect on the resources.
Describe several things we can do in our everyday activities to lessen the fire hazard and/or cause a minimal amount of harm to the ecosystem.
Communicate your feelings, awareness and values by describing in writing the positive effects of a prescribed burning.

Equipment Needed

6 hand lenses
Task cards
20-40 meter measuring tapes
Flagging string or colored tape
Tools in multiple of number of anticipated groups

Outline for Measuring the Environment

With the competition for land use increasing rapidly and the necessity for a better understanding of proper zoning and land utilization, a knowledge of land measurement and spatial relationships is essential. The following activities and tasks can provide some simple tools to involve students in land and space measurement.

This lesson plan outline includes seven activities and skill areas to assist in constructing several types of maps that can be used in environmental investigations.

Adapting Lesson Plan to Your School and Community

Name of Lesson: Measuring the Environment

Process Skills: Measuring, recording, interpreting, analyzing, constructing, describing, interpreting, communicating, investigating, exploring.

Suggested Grade Levels: 4-12. Mathematics, Social Studies, Language Arts, Science. This activity involves students by utilizing process skills in a variety of disciplines to experience, understand or improve local environs.

Environmental Study Sites: This lesson plan can be used in a rural, suburban or urban environment such as a school ground, neighborhood, city park, forest, farm, yard, outdoor laboratory or nature center.

Designing Additional Experiences: *Total Environment Education* (see resource list)

The metric system should be used for those schools who have staff qualified to make the transition.

I. MEASURING THE LENGTH OF YOUR STEP (20 minutes)

The first skill needed to estimate distances without using a tape measure. Instructions and directions on page 97.

II. LEARNING TO USE THE SILVA COMPASS (20 minutes)

This is needed in order to calculate and record directions and distances of given areas. Instructions and directions on page 99.

III. USING THE COMPASS AND PACING SKILLS (30 minutes)

Playing the Compass and Pacing Game by using the length of step (I) and the compass (II) allows the participant to apply these two skills in a problem-solving situation. Instructions and directions on page 104.

IV. CONSTRUCTING AND USING THE INSTANT MAPPER (60 minutes)

The instant mapper is an inexpensive way to make a map using bearing and distances collected using the skills learned in I, II and III. Use the Instant Mapper to plot some of the Compass and Pacing Game problems in III to check out proper spacing. Instructions and directions on page 106.

V. LAYING OUT A NATURE TRAIL (120 minutes)

One way to apply the compass, pacing and instant mapper skills is to lay out a nature trail from scratch or to reconstruct one from a given set of bearings and distances. Instructions and directions on page 108.

VI. CONSTRUCTING AND USING A CARDBOARD BOX PLANE TABLE (60 minutes)

Many times it is not possible to learn to use a compass or an instant mapper. The Cardboard Box Plane Table provides a way to make a map without the use of the compass. Teachers find this an easy way to involve primary students in map making. Instructions and directions on page 113.

There are many other simple methods to measure the environment. Examples include learning to use maps, compasses, aerial photos, abney (compass) levels and homemade transits. Whatever methods and activities are used, measurement of the environment provides a tool to further interpret the information we collect.

VII. COMMUNITY FEELINGS, AWARENESS AND VALUES ABOUT MEASURING THE ENVIRONMENT

TASK A

1. Describe in writing three contributions that measuring the environment can make to environmental management.

2. Describe at least one measurement activity that you can take in your everyday life to make a contribution to the management of your community.
   a. in your home _____
   b. in your community _____

3. Describe the benefits of each action in Activity 2.

Questions and discussion

1. What are some processes we've used during these activities?
2. What contributions can measuring the environment make to environmental management?
3. How can you use this in other areas?
4. What are some problems encountered during these tasks?
5. How can we sum up our activities in two or three big ideas?

TASK B

Describe in writing how you feel about our session today.

Behavioral Outcomes in Knowledge

As a result of these activities you should be able to:

Compute the length of your average step, given a premeasured 100-foot distance.
Demonstrate your knowledge of the compass by accurately setting a given bearing and following that bearing for a short distance.
Demonstrate your knowledge of the compass by sighting on an object and setting the correct bearing and following that bearing for a short distance.
Construct and use an instant mapper, determine the proper scale to use and lay out and map a six-sided nature trail.
Construct and use a plane table and accurately map a predetermined area, including at least three reference points.
Using a constructed plane table, you can measure a nonpaceable distance.

Behavioral Outcomes in Feelings, Awareness, Values and Action

As a result of these activities you should be able to:

Describe your ability to use a compass.
Describe if and why you feel more secure in the environment with a knowledge of how to measure the environment.
Describe how you feel about the value of measurement in the environment.

References

Mapping by David Greenhood
Be Expert With Map & Compass by Bjorn Kjellstrom
Map, Compass and Campfire by Don Ratliff
Map & Compass by Forest Service, PNW Region, Putting Conservation to Work, Recreation Aid No. 2, U.S. Forest Service, P.O. Box 3623, Portland, Oregon 97208

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1. MEASURING THE LENGTH OF YOUR STEP

Measuring the length of your step is the first task to be done before measuring the environment.

Equipment Needed:

21 stakes numbered consecutively
100-foot tape
Silva compass to lay out E-W line
Pencils with erasers
Length of step chart
Step-foot conversion charts
Hammer or rock to pound stakes
Instructions for laying out
Boy Scout Compass and Pacing Game

Questions and discussion:

1. The distance from the first to the last stake in this course is 100 feet. Refer to stakes set up for compass games.

2. Walk an even, normal step all the way down, then all the way back.
3. What will be the total distance you walk? (200 feet)
4. Count the total number of steps you take on the way down and on the way back. Don't let people jam up in a line as they are walking to avoid making their steps uneven.
5. How will you determine the length of your step? Divide the total distance (200 feet) by the total number of steps you took. Round it off to the nearest foot or nearest half-foot, either 2 feet, 2½ feet or 3 feet for adults.

TASK: (10 minutes)

Walk (in a normal step) the 100-foot distance two times and, using the Method 1 chart, calculate the length of your step.

Determining Length of Step:

Method 1

Walk two times (in a normal step) the distance marked off. Record number of steps you took each time.

Number of steps 1st time _____
Number of steps 2nd time _____
Total steps (A) _____

Total number of feet in distance walked (B) _____

_____ ÷ _____ = _____

(B) (Total distance walked)	(A) (total steps taken)	(C) (number of feet in each step)

Method 2

No. of steps in 200 feet	Length of step
66 – 73	3'
74 – 87	2.5'
88 – 113	2'
114 over	1.5'

NOTE: *Round the length of your step to the nearest half-foot: 2 feet, 2½ feet, 3 feet and 3½ feet.*

Questions and discussion:

1. When most people have finished dividing, have them turn over the Method 1 sheet and use Method 2 to check their answers. This will be funny because most people will not have looked on the back side.
2. Using the chart and Method 2, if the total number of steps taken were _____, what would be the length of step for that person? This way, if the kids haven't learned to divide yet, they can still figure out the length of their step without you having to figure it out for each one of them. This chart has been devised so that everyone can check their dividing at the same time. Left column gives total steps in 200 feet. Right column gives the length of your step if you are within that range.
3. Another aid to help you quickly convert distances into steps or vice versa is this *Step-Foot*

Conversion Chart. Distribute Step-Foot Conversion Chart showing distances and lengths of steps and discuss how to use. Left column gives distances. Right column gives number of steps needed to travel specific distances.

4. For example, if you wanted to go 50 feet, using this chart, how many steps would you take if the length of your step were 1½ feet? _____ 2 feet? _____ 2½ feet? _____ 3 feet? _____

Distance Column	*Length of Step Columns—*			
If you want to walk this distance	*1½ feet Then take*	*2 feet*	*2½ feet*	*3 feet*
1 foot	½ step	½ step	½ step	½ step
2 feet	1 step	1 step	1 step	½ step
3 feet	2 steps	1½ steps	1 step	1 step
4 feet	2½ steps	2 steps	1½ steps	1½ steps
5 feet	3 steps	2½ steps	2 steps	1½ steps
6 feet	4 steps	3 steps	2½ steps	2 steps
7 feet	5 steps	3½ steps	3 steps	2½ steps
8 feet	5½ steps	4 steps	3 steps	2½ steps
9 feet	6 steps	4½ steps	3½ steps	3 steps
10 feet	6½ steps	5 steps	4 steps	3 steps
20 feet	13½ steps	10 steps	8 steps	6½ steps
30 feet	20 steps	15 steps	12 steps	10 steps
40 feet	26½ steps	20 steps	16 steps	13 steps
50 feet	33½ steps	25 steps	20 steps	17 steps
60 feet	40 steps	30 steps	24 steps	20 steps
70 feet	46½ steps	35 steps	28 steps	25 steps
80 feet	53½ steps	40 steps	32 steps	27 steps
90 feet	60 steps	45 steps	36 steps	30 steps
100 feet	66 steps	50 steps	40 steps	33 steps

5. Figure out how many steps you'd take to go 122 feet if the length of your step were 2 feet _____ 2½ feet _____.
   This is easier if you first figure how many steps for 100 feet, how many steps for 20 feet and how many for 2 feet, and then add those three sums for a final total.
6. We've been using steps and not paces. The length of your step should not be confused with a pace. A pace is the distance covered on the ground when a person takes two steps. For instance, if your length of step is 2½ feet, then your pace is 5 feet. This simplifies your math if, for instance, you want to walk 100 feet. By this way you can count every other step and keep running tally, 5, 10, 15, etc. Steps or paces may be used at the option of the instructor. Sometimes it's easier to start counting every *step*, instead of every other step which equals a *pace*.
7. Have students check the accuracy of their steps or paces by walking other predetermined distances and calculating the distance from steps to feet.

II. LEARNING TO USE THE SILVA COMPASS

The second task is learning how to use the Silva Compass. The Boy Scout Compass and Pacing Game is a simple, effective aid in this task. It is available at Boy Scout supply stores.

Equipment Needed

Stakes laid out according to instructions in Boy Scout Compass and Pacing Game
Silva Compass for everyone

Scotch tape with declination marked off on all compasses
Score cards for everyone and one set of answers to the game problems for all instructors (included in game)
Illustration of differences between true and magnetic north

Parts of the Compass:

Questions and discussion:

1. Give everyone a Silva Compass and have each one stand up facing you. Make sure the compass has the piece of write-on scotch tape with a pencil mark on it opposite the declination for your area. *Do not* let the audience do this sitting down.

2. The Silva Compass is used in this lesson. It is *one of the least expensive, most dependable and easiest compasses to use.*

3. What do you notice as you look at the compass?

Major parts to discuss with students:

Base Plate

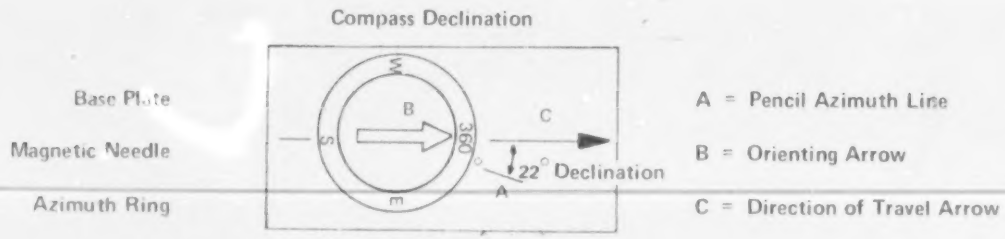
What is on it?
Direction of travel arrow — always pointed directly away from you.
Clear plastic, has direction of travel arrow and two different scales.

Compass Housing

A dial (azimuth ring) with degrees marked on it. It has an orienting arrow inside the bottom of housing. This arrow is the thing that makes the Silva Compass easy to use and different from all other compasses.

Magnetic Needle

This compass has a red and white needle.
Where does it point? (Magnetic north)
What makes it point there? (Earth's magnetic field)
The needle pivots freely within the azimuth ring, and the red end always points to magnetic north.



Holding the Compass Correctly:

It is important to learn to *hold the compass* correctly.

1. Stand up; rest base plate on your index fingers; hold the edges with your thumbs; keep your arms close to your sides for better stability, and point the direction of the travel arrow directly away from you.

2. Hold compass level and tilt compass up and down from side to side to see what happens when not level.

3. You and the compass are a *unit*.

4. When you turn, the compass turns with the direction of travel arrow, always pointing away from you. Turn your whole body and compass, including feet, don't just twist around. Have the group practice this task.

Orienting to North:

Let's orient ourselves to north.

1. Turn dial and set 360 degrees on direction of travel arrow.

2. Turn yourself and the compass as a unit until the red part of the magnetic needle and the pointing part of the orienting arrow go together.

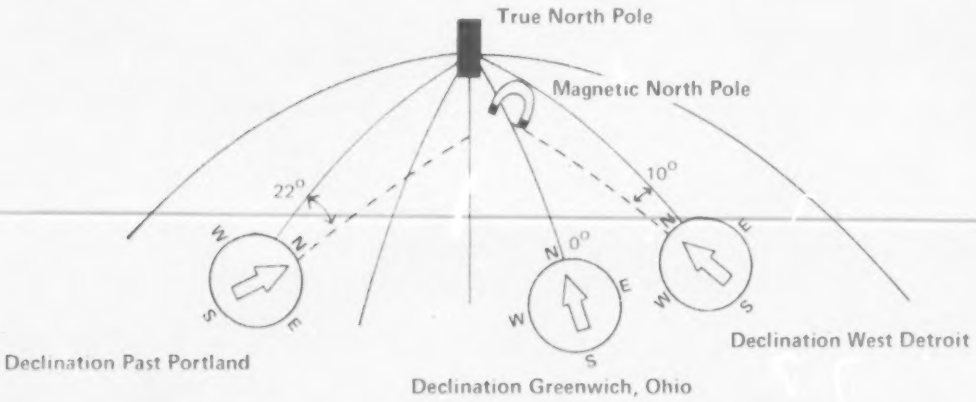
3. Where does the magnetic needle point? (North – magnetic north.)

4. Are you facing the same direction as the magnetic needle? (Yes, you should be.)

5. Which direction are you facing? (Magnetic north, same as the magnetic needle.)

6. Is magnetic north the same as the North Pole? (No, North Pole is called Geographic North or True North.)

NOTE: *Refer to chart of North Pole and the magnetic pole. (Magnetic north is located somewhere north of Hudson Bay, Canada, in the Gulf of Boothia.)*



If you are here (point to your location) and facing the North Pole, then magnetic north is at a _____ degree angle to the right of you, in parts of western Oregon and Washington. Find your declination. In Portland, Oregon, it is about 22 degrees.

If you're in Greenwich, Ohio, and facing the North Pole, then magnetic north and the North Pole would be in the same line of sight.

Most of the maps we use are drawn according to the North Pole, or true north.

Correcting for the Declination (the difference between true and magnetic north):

Questions and discussion:

1. On your compass is a piece of tape with a pencil line on it at _____ degrees. (22 degrees for Portland, Oregon)
2. Turn dial and set 360 degrees on the pencil line.
3. Now turn yourself and the compass until the magnetic needle and orienting arrow go together.
4. Which way does the magnetic needle point? (Magnetic north – it always points there.)
5. Are you facing the same direction as the magnetic needle? (No, you shouldn't be.)
6. Which direction are you facing? (True north)
7. You and the direction of the travel arrow should be facing true north. The magnetic needle should be pointing to magnetic north at a _____ degree angle to your right.
8. From now on we will *set all degree readings at the pencil line.*
9. From now on we will *read all degree readings from the pencil line.*
10. We will continue to hold the compass so that the *direction of the travel arrow is pointing directly away from us.*

Practice Orienting to the Four Cardinal Compass Points:
(N-0 degrees, E-90 degrees, S-180 degrees, W-270 degrees)

Questions and discussion:

1. Set 90 degrees on the pencil line and orient yourself to that degree reading. This means that you and the compass should move as a unit until the red part of the magnetic needle and pointing part of orienting arrow go together.
   Which direction are you facing? (True east)
   Which direction is the magnetic needle pointing? (Magnetic north)
   Helpful hint in explaining difference between magnetic and true bearing: Extend your arm in the direction of true north.
   With your arm, make a 90-degree swing to the right. That should be the direction you are facing.
   Extend your arm in the direction of magnetic north. Now make a 90-degree swing with your arm to the right.

That should be magnetic east, which should be at a _____ angle to the right of where you are facing.

2. Now set 180 degrees on the pencil line and orient yourself to that degree reading.
   Extend your arm in the direction the magnetic needle is pointing. (Magnetic north)
   Now extend your arm directly opposite, which should be magnetic south.
   Which direction are you facing? (Magnetic south)
   Which direction is the magnetic needle facing? Which direction does it always face?

3. Repeat for 270 degrees.

Following a Predetermined Azimuth Bearing:

NOTE: *Before class, the instructor should pick a point and sight on several objects (up to 10). He should give the group bearings to set and then objects to sight on, until the group is confident in using the compass.*

Questions and discussion:

1. Set _____ degrees on pencil line.

2. Orient yourself to that degree reading. (Review part on holding compass correctly.)

3. Select a landmark in the line of sight found by you and the direction of travel arrow. To do this, look down at the direction of the travel arrow, then jerk your head up. Whatever you see on the horizon, in line of sight of the travel arrow, is your landmark. Repeat this several times, to make *sure* you are sighting an object that is directly in line of sight of the travel arrow.

4. Now that you have selected a landmark, you could put your compass away and walk toward it, always keeping your eyes on that landmark and walking straight toward it.

5. Why wouldn't you keep looking at your compass as you walk along? You could wander all over the place. Perhaps a chart or simple diagram could explain this point. People seem to have a hard time understanding that it would make any difference.

6. Orient yourself to _____ degree reading.

7. Select landmark. Repeat previous instructions on selecting a landmark if necessary.

Practicing Using the Compass to Follow a Bearing (Optional):

Get a partner. Give that person a degree reading. Check to make sure that person can orient to that degree reading.

Did he set the degree reading on the pencil line?
Did he hold the compass level?
Is the direction of travel arrow pointing away from him?

Check to make sure that person can select a landmark.

Is the person looking up directly in line with the direction of the travel arrow? (Most people tend to look either to the right or left, so watch them select the landmark.)

Is the person holding his head straight and in line with the rest of his body and the compass?

Repeat, having the other person check you this time.

III. USING THE COMPASS AND PACING SKILLS

Preparing to Play the Compass and Pacing Game:

Questions and discussion:

NOTE: *Notice that the number of each problem corresponds with the stake with that number.*

1. Distribute score cards for game (Boy Scout Compass and Pacing Game).
2. Before we explain the game, write down the number of steps you need to take for each of the distances given. Use the Step-Foot Conversion Chart.
3. When most people have finished this, select a volunteer to demonstrate the game.
4. Take his score card from him and yell his instructions to him while the group watches (or try to get the group to tell him what to do).
5. Starting place _____.
6. Degree reading _____. Set degree reading on pencil line. Orient to that degree reading. Select landmark and put compass away.
7. Distance to walk _____. Tell the group the distance and length of volunteer's step, and have them figure out how many steps he needs to take.
8. Repeat for the second instruction.
9. Repeat for the third instruction.
10. Ask him which stake he ended on. Tell him which stake he was supposed to end on.
11. Explain how the scoring works.
12. Give volunteer his score.
13. Anything above 70 is *good*!! If they get below 70, maybe they should do it over.

Playing the Game:

Questions and discussion:

1. Okay, go ahead and do the problem, I have the answers.
2. Help individuals. If someone in the group finishes first and is pretty good, have him help others or give him the answer sheet and free yourself to help.

TASK A (30 minutes) Use Boy Scout Compass and Pacing Game.

Complete the Boy Scout Compass Course. Complete two out of three of the courses within a 5-foot error. Do extra problems if time.

Score Card for Compass Course

NAME _____

Starting Point No. 2 — No. Steps

Go 17 degrees for 104 feet _____
Then 150 degrees for 52 feet _____
Then 171 degrees for 55 feet _____

Destination (Number of nearest marker reached) _____

Correct Destination (Supplied by leader) _____

Score (Score for correct finish is 100. Deduct 5 points for each marker missed correct destination.) _____

Starting Point No. 3 — No. Steps

Go 38 degrees for 125 feet _____
Then 237 degrees for 90 feet _____
Then 187 degrees for 50 feet _____

Destination (Number of nearest marker reached) _____

Correct Destination (Supplied by leader) _____

Score (Score for correct finish is 100. Deduct 5 points for each marker player missed correct destination.) _____

TOTAL SCORE _____

Questions and discussion:

1. What things did you have trouble with in solving the problem?
2. More practice will help increase accuracy.
3. While following an azimuth or line of sight, you may lose the landmark you are walking to and need to check your location to determine if you are still on the correct line of sight. To do this, sight backward toward your starting point and then check your compass to see if you are still on the line. This requires sighting a *back azimuth* which is in the opposite direction from the azimuth.

TASK B (15 minutes) Optional

Start a given point (Point A). Take a reading (azimuth) on an object. Proceed to that point (Point

B). At Point B, set your compass to return to Point A and follow back.

Questions and discussion:

1. What sort of hypothesis would apply to the shooting of a back azimuth?

2. Possible answer: If the original bearing is less than 180 degrees, add 180 degrees in the last step. If it is more than 180 degrees, subtract 180 degrees in the last step. Reverse the red arrow so that the tail of the red arrow is superimposed over the head of the black arrow in the compass housing (as in the first step).

Taking a Bearing on a Given Object:

Questions and discussion:

1. Now let's use the compass to find out in what line of direction a given object is from you. Select an object that everyone can see.

2. Face the object.

3. What do you have to do now? You have to get the magnetic needle and the orienting arrow lined up together. How will you do it? (Turn the dial.)

4. Now read the degree reading. Where will you read it from? (The pencil line, not the direction of travel arrow.)

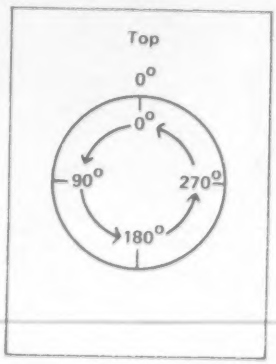
5. Why do people on one side of the group have different degree readings than people on other side? (Everyone is at different angles to the object.)

6. Practice a few times.

IV. CONSTRUCTING AND USING THE INSTANT MAPPER

There are many ways to make maps, but one of the easiest and most fun is by using the instant mapper. Your students can easily make the instant mapper and learn how to use it.

Instructions for Making Instant Mapper:



Materials:

1 piece corrugated cardboard, 8½" x 11" (smooth both sides)
1 piece graph paper, 8" x 10½"
1 piece *clear* contact paper (adhesive on one side) 8½" x 11"
Scotch or masking tape, 1" or 2" wide and 40" long
1 brass fastener 7/16 of an inch
1 acetate disc, frosted one side, 7"
Scissors

Making the Azimuth Graph Paper Sheet:

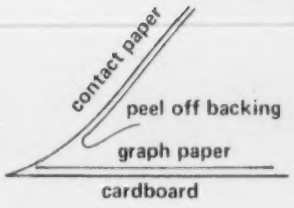
Draw a 6¼" diameter circle in the middle of graph paper. Label one end of the graph paper (8" width) "top." Starting at the part of the circle closest to the top of the graph paper, mark and label every 10

degree azimuth running counterclockwise on the inside of the circle. See diagram.

Constructing the Mapper:

1. Position graph paper on cardboard in order to leave edge of cardboard exposed for contact paper to adhere.

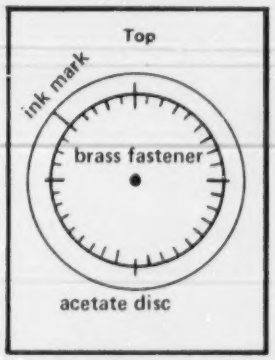
2. Peel back edge of paper covering the sticky part of contact paper and position the sticky part at top of cardboard and graph paper. Now strip off rest of contact backing paper and smooth the clear part over the cardboard and graph paper.



3. Take Scotch mystic tape or masking tape and bind edges of instant mapper.

4. Center the acetate disc over the circle on the graph paper with the rough side up.

5. Make a slit (with knife) through the cardboard and acetate at center of the circle.



6. Push the brass fastener down through the acetate disc, through the slit in the mapper and bend back the fastener prongs.

7. Make one straight ink mark from any point on the edge of the acetate toward the brass fastener until it meets the circle on the graph paper. (This is your map-making orienting mark.)

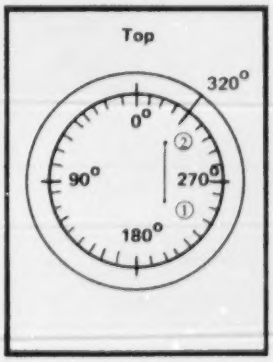
8. Attach a short piece of masking tape to the outside of the acetate disc to use as a handle.

Making a Map:

The instant mapper is designed to draw the map of your area as you determine the compass bearings and distances. (It will be easier to learn to use if you already have the bearings and distance recorded of the area you want to map. Map one of the Boy Scout Compass and Pacing Problems.)

Here is how to map an area with the following field notes.

Degree Reading	*Field Notes*	*Dist.*
320°	←— 20' —→ ←— 5 —→	25'
225°	←— 20' —→ ←— 10' —→	30'
85°	←— 10' —→ ←— 25' —→	35'



1. *Plotting the first bearing and distance*

   a. Turn the acetate disc until the ink line is directly over the 320° mark on the dial.

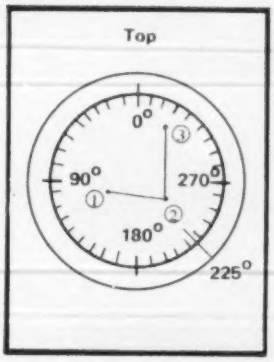
   b. Pick any point where two graph paper lines cross and put a dot on the acetate disc at this point and label with a "1".

   c. Determine a scale for your map. Let's say that each square is

97

one inch. (Select a scale that allows you to draw your whole map on the acetate disc.)

d. Draw a line from Point 1 at the top of the instant mapper parallel to the lines on the graph paper (25 squares for 25 ft.). Put a "2" along side the point where the 25 foot distance ended.



2. *Second Bearing and Distance*

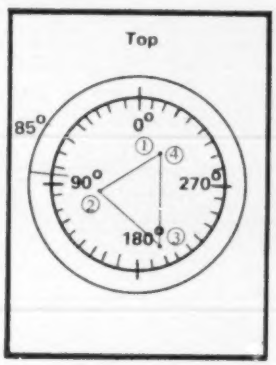
a. Now turn the acetate disc until the ink mark is directly over the 225 °mark on the dial.

b. Draw a line from Point 2 toward the top of the instant mapper for 30 feet (30 squares) parallel to the lines on the graph paper. At the end of the line make a dot and label it "3".

3. *Third Bearing and Distance*

a. Now turn the acetate disc until the ink line is directly over the 85 °mark on the dial.

b. Draw a line from Point 3 toward the top of the instant mapper for 40 squares (40 ft.) parallel to the line on the graph paper. At the end of the line make a dot and label it "4". Point 4 should coincide with your starting Point 1.



Directions to Draw Land Features on Map:

1. Stand at starting Point 1 and face ground Point 2.

2. Hold mapper waist high and turn acetate disc until the ink mark is on 320 °on the inside dial. You and the instant mapper and the line from Point 1 to Point 2 should all be facing Point 2 on the ground.

3. Next measure distances along the line by pacing. Put in any land features such as trees, fences, roads or buildings that you want located on the map.

4. Repeat for other bearings and distances.

V. LAYING OUT A NATURE TRAIL

One way to apply the compass pacing and instant mapper skills is to lay out a nature trail from a given set of bearings or distances.

Ahead of time have a traverse layed out in the immediate area. Make a course following either of these two ways:

1. Lay out azimuths and distances to each point along the trail. Example: Start at the apple tree, go 319 degrees for 150 feet.

2. Describe each point (from a known beginning) and ask them to jot down the azimuth and distance to the point. Example: Starting at the apple tree, there is an alder tree northwest of here. What is the bearing and distance, etc.?

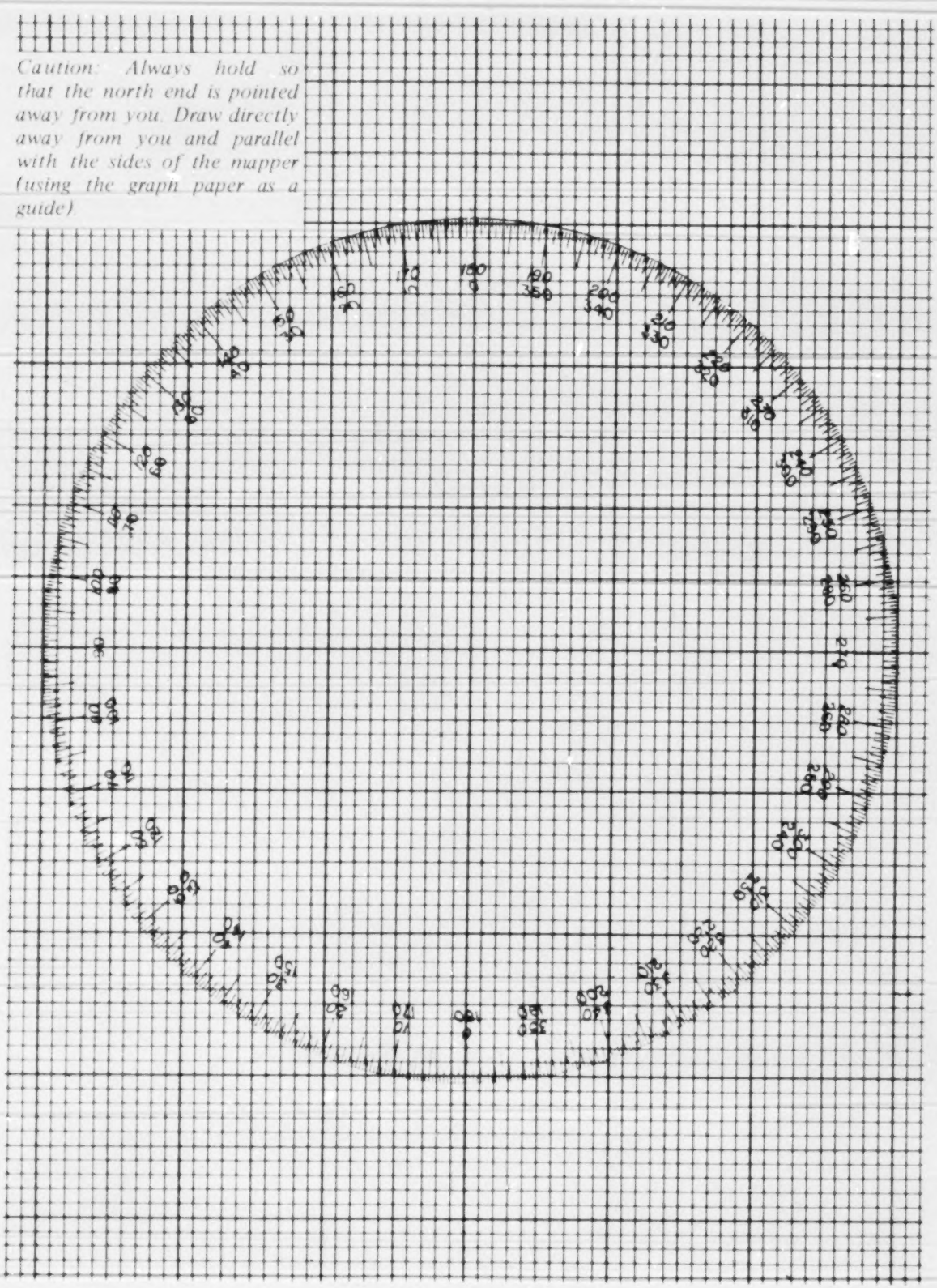
TASK A: (90 minutes) Work in a group of 3 or 4.

From the bearing and distances on this sheet, construct a nature trail map using pacing, compass and instant mapper skills. Do Task B as you reach each station. Include the following on your map: scale, date, north arrow, legend, title and map marker names.

Start at a 40 foot snag. Go 120 feet at 60 degrees to Station 2. Then go 23 feet at 294 degrees to Station 3. Fifty-three feet at 285 degrees to Station 4. One hundred-thirteen feet at 285 degrees to Station 5. One hundred seventy-three feet at 175 degrees to Station 6. Ninety-nine feet at 152 degrees to Station 7.

What is the distance and direction to your starting point?

Caution: Always hold so that the north end is pointed away from you. Draw directly away from you and parallel with the sides of the mapper (using the graph paper as a guide).



TASK B: (30 minutes) Fill in the following from observations made at each stop on your map.

Start at the large black cedar snag marked with blue flagging. This is Station 1 and your first stop.

Write down your observations and questions. (Do this at each succeeding station.)

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

This is Station 2

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

This is Station 3

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

This is Station 4

1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

Completed Example of Task B:

Cypress Nature Trail Teacher's Guide

1. *Large Cedar Snag*

   What do you notice about this snag?
   How do you think it got killed?
   How does it affect the environment?

2. *Beaver-Gnawed Maples*

   What kind of animal do you think could have caused those scars?
   What can you tell us about this animal?

3. *Cat- or Bear-Clawed Alder*

   Can you make up a story about what happened here?

4. *Sixty-Year-Old Douglas Fir Growing in the Remnants of a Cedar Snag*

   Describe what you see here.
   List the events from the oldest to the youngest that you think took place to have this happen.
   What does this tell us about the history of this area?

5. *Cedar Stump, Fire Killed, Cut and With a Hole in the Base*

   What do you think happened here?
   What kind of an animal might live in that hole?

6. *Old Scribed Survey Stake* (Have map of area showing survey lines at stake.)

   What do you notice about this stake?
   What are some reasons it might be here?
   Find the location of the stake on the map.
   What are some reasons for land surveys?

7. *Remnants of a Barbed-Wire Fence*

   Why do you think this fence is here?
   What is the significance of the fence to animals?
   Where does it or did it go?

VI. CONSTRUCTING AND USING THE CARDBOARD BOX PLANE TABLE

A plane table is a device for mapping an area without using compass bearings. Only one measurement is needed – that of a base line. All objects to be mapped are then located by triangulation (the intersection of two lines).

The plane table can be used to make a map of a schoolyard, an environmental study area, a schoolroom or your own backyard.

A minimum of two and a maximum of five persons per group should be used.

Equipment Needed:

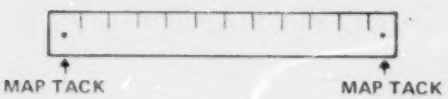
3 cardboard cartons
Unlined paper 8½" x 11"
Wooden 12" rulers (one per table)
Map tacks (4 per group – small nails will do)
Masking tape
Pencil with eraser
Plastic flagging – 2 colors
Heavy twine
Stakes (2 per group)
Sacking needles (Optional. Can be obtained from Duncan & Sons, Inc., 313-17 2nd Ave. S., Seattle, Wash. 98104, Phone: MA 2-1310)

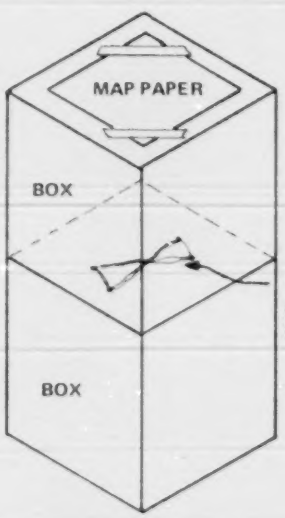
Constructing the Plane Table:

1. Place cardboard boxes one on top of the other. Thread boxes together with a sacking needle and stout cord. (Smaller children may want them on their sides.)

2. Tape paper to the top of the box.

3. The 12" sight ruler will be used as a *sighting guide*. Drive map tacks into the ruler making sure tacks are equidistant from one edge of the ruler.



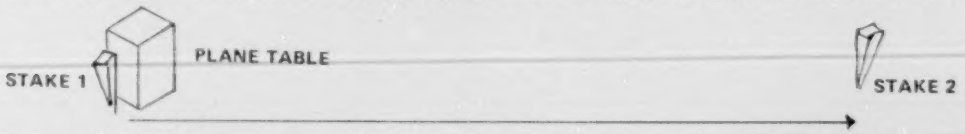


Using the Plane Table:

1. Establishing a Base Line

   a. After you determine the area to be mapped, pick two objects to be included in the map that are the farthest apart. Set up your plane table near one of these objects to be included in the map.

   b. Drive a stake at the base of the plane table. Now pace the longest distance that must be mapped and drive in the other stake. On the way back to the plane table, measure the distance. THIS IS YOUR BASE LINE AND THE ONLY MEASUREMENT NEEDED.



   c. Choose a place on the paper for a starting point for your map (this can be anywhere, just so you can get the rest of the map on the paper).

   d. Stick a pin in the paper at the starting point. Put the edge of the sight ruler against the pin.

   e. Get your head down toward the plane table so you can sight over the pins of the sight ruler toward Station 2, the second point on your map.

   f. Keeping the edge of the sight ruler against the pin, line up the tops of the two pins on the sight ruler so that they are in a direct line with Station 2.

   g. Draw the first line on the paper, from Station 1 toward Station 2. (Be sure you don't shift the ruler while drawing this line.)

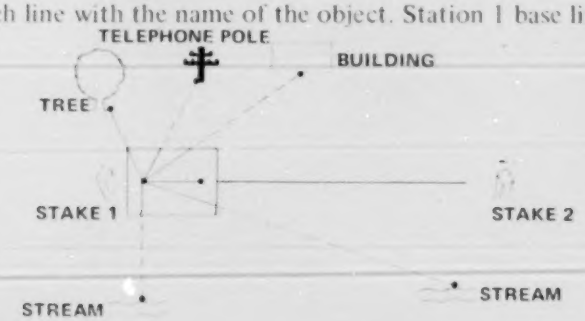
2. Locating Map Features

   a. Now you are ready to draw lines toward all the other features you want to include on your map. It is done the same way you drew the line toward Station 2. The theory behind using the plane table is to locate points of intersecting lines.

   b. Do not move the plane table. Keeping the edge of the ruler against the pin, line up the tops of the two pins on the sight ruler so they are in direct line with the object you wish to include on your map.

   c. Keeping the ruler still, draw a line from the pin along the edge of the ruler to the end of the ruler.

   d. Label each line with the name of the object. Station 1 base line of plus rays:



3. Measuring Base Line and Determining Scale

   a. Pick up the plane table and walk to Station 2, counting the number of steps between Station 1 and 2. (This is your base line.)

   b. The size of the area to be mapped determines the scale of the map. Given an 8" wide paper at scale 1" = 100', the map will have a space 800' wide. Given an 8" wide paper at scale 1" = 40', the map will have 320' wide. Given an 8" wide paper at scale 1" - 20', the map will have a space 160' wide. (Since we are using standard rulers having inches and ¼ inches, the scale is best divisible by 4'. Thus if 1" = 40', then ¼" = 10'. If 1" = 20', then ¼" = 5'. If 80', then ¼" = 20'.)

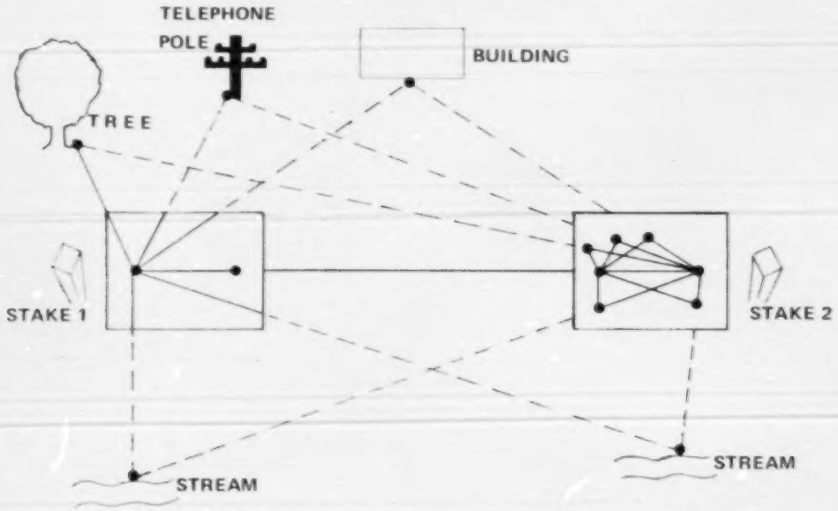
   c. This must be determined by observation and estimation and by actually measuring the greatest distance between two objects to be included on the map.

4. Orienting the Plane Table Between Station 2 and Station 1

   a. Measure and place a pin on your map at the point indicating Station 2. (Position determined by scale.)

   b. Put the sight ruler up against this pin and sight backwards to Station 1, turning the plane table so that the edge of the ruler runs exactly along the line you just drew.

   c. Your plane table is now oriented to Station 1. DO NOT MOVE THE PLANE TABLE AGAIN. Station 2 plus rays:



5. Plotting Features on the Map

   a. You are now ready to locate the positions of those objects on which you sighted in Step 1.

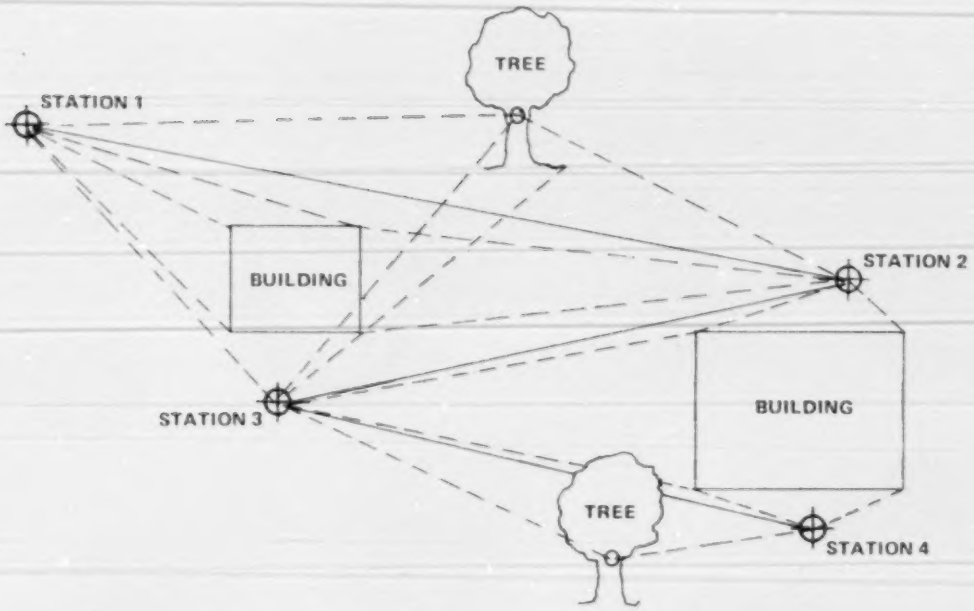
   b. Let's say that one of the features you wanted to include on the map was a lone apple tree. Without moving the plane table from its orientation to Station 1, put the edge of the sight ruler against the pin indicating Station 2 and line up the tops of the two pins on the sight ruler so they are in direct line with the apple tree.

   c. Without moving the ruler, draw a line along the edge of the ruler toward the apple tree. The

line you are drawing now should cross the line you drew in Step 1. Where the two lines cross is the location of the apple tree on the map.

d. Repeat this procedure for all the other features you wanted to include on the map (and for which you drew lines in Step 1).

e. This procedure may be carried on indefinitely, such as setting up a Station 3 beyond Station 2. This could be a prolongation of base lines 1-2 or it may be in another direction.



——— Base lines
– – – – Intersecting lines to locate features to put on map.

Investigating an Environmental Issue

Adapting the Process Investigation to Your School and Community

Name of Investigation: Environmental Issue

Process Skills: Interpreting, collecting, recording, describing, analyzing, summarizing, recommending, evaluating, comparing.

Suggested Grade Levels: 8-12. Social Studies, Science, Language Arts, Creative Arts, Mathematics, Health. This activity involves students by utilizing process skills in a variety of disciplines to experience, understand or improve local environs.

Environmental Study Sites: This investigation can be used in a rural, suburban or urban environmental study site such as a shopping center, school, small town, industry, housing area or neighborhood.

Designing Additional Experiences: *Total Environment Education* (see resource list)

As a result of participation in this environmental investigative process, participants will have:

Phase I: Identified, collected and analyzed data and information about the issue.

Phase II: Identified and listed individuals and/or groups who might be interested or affected by the issue and identified questions and concerns they might have about the issue.

Described in writing a summary of interest groups and points of view.

Described in writing the history of an assigned interest group. Roles played are those that groups position in a simulation model about the issue.

Phase III: Developed an action plan for implementing a recommendation.

Constructed and presented recommendations for a solution of the issue to the decision-making body.

Phase IV: Constructed a list of criteria to evaluate the presentations and recommendations and will have made a decision based on that criteria.

Phase V: Described in writing his ideas about the processes in which he was involved.

Phase VI: Constructed a matrix of at least six different information sources and made a comparison between the study and the real issue.

CREDITS: *This study process has been adapted from the Tussock Moth Issue – Simulation Game, developed in the winter of 1973 by the Tussock Moth Education Committee of the Portland Metropolitan Environmental Education Council (Char McDonald, chairperson; Gay Bower, Chuck James; Verle Duckering; Ernie McDonald, and John Thompson).*

A Process for Investigating an Environmental Issue

The processes and procedures included here for investigating an issue were developed because of the need to involve people more meaningfully in the study of current problems and issues relating to environmental use and management. It is designed to be used by an individual or group interested in investigating an environmental issue. It is a logical process for educators and students to use in school classes.

This series of involvement activities allows you to focus on a current environmental issue or situation. The process is designed so that you can use all or selected phases depending upon the objectives of the study. For example, Phase I is usable by itself as the basis for analyzing data for an issue and having a group discussion about it. If all the phases are used, they combine the elements of role playing with a simulated decision-making process or simulation model. Each phase identifies sound options to consider (from large group to small group interaction) in studying the issue.

The process and format used here can be easily modified or adopted to fit the study of any environmental issue or concern. The study can be as brief or as long as the motivation and interest of the audience.

Here are some things to consider in planning how to use this process with a group of students.

1. Analyze the needs of your students.
2. Analyze the time constraints in your teaching situation.
3. Analyze the role that this plays in your curriculum.
4. Decide what phases of the process you want to accomplish.

The study of environmental issues usually involves a variety of considerations such as:

Most environmental issues are extremely complex.
There are many varied interest groups affected by any situation.
The factors affecting a situation are many, such as:
- a resource commodity
- a land use planning policy
- weather and climate
- a local economy
- management policies of different agencies
- land ownership
- recent national environmental policy

The effects of an issue and any action about it can be:
- local
- statewide
- regional
- national
- international

An issue has both short-range and long-range effects and implications:
- economically
- politically
- socially
- environmentally

Environmental issues, like many other issues today, have no absolute rights or wrongs, no single answer.

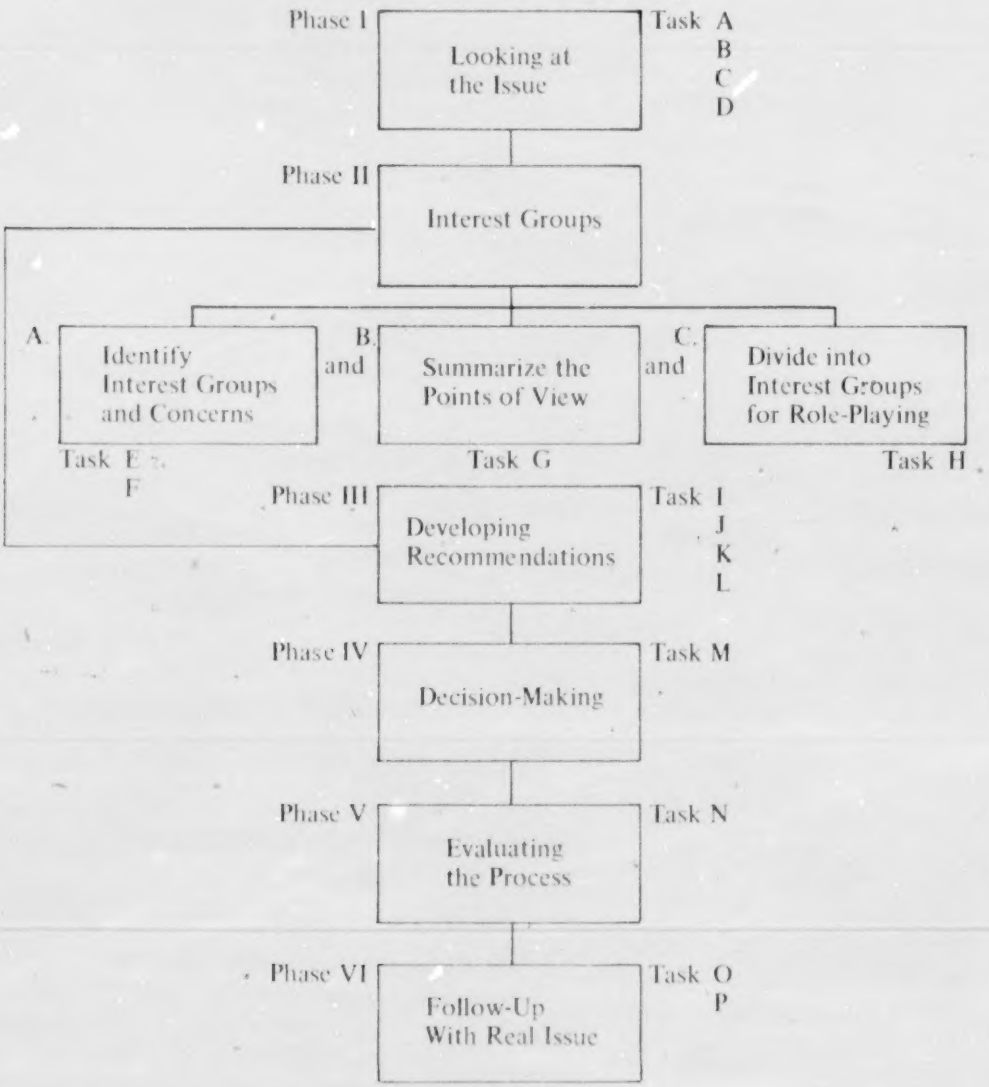
Any decision about an issue will be a selection of one of several possible alternatives. It may reflect trade-offs in values of the factors involved and the people and groups affected by the decision.

The use of lesson plans in the Investigating Your Environment Series, such as Soil Investigations for Land Use Planning, Measuring Some Water Quality and An Urban Investigation, may help in collecting and analyzing information about the issue.

This process should be modified and changed to best meet the objectives and the needs of the group using it.

A Flow Chart of the Process

This flow chart illustrates the phases and tasks that a group can follow in investigating this issue.



Teacher Planning Sheet

For optional use by teachers in planning the activity.

You will notice that in each phase several procedural options are given. The teacher or facilitator should select or help the participants select the most appropriate option based on the time constraints, needs, capabilities of the student and the objectives of studying the issue.

Check Option

PHASE I: LOOKING AT THE ISSUE (Tasks A to D)

Options:
- Entire class _____
- Selected students _____
- Teacher _____

PHASE II: IDENTIFYING POINTS OF VIEW OF INTEREST GROUPS (Tasks E to H)

A. Identify interest groups

Options:
- Entire class _____
- Teacher/small groups _____

B. Summarize interest groups' points of view

Options:
- Entire class _____
- Small groups _____

C. Divide into interest groups for role playing

Options:
- Entire class into interest groups _____
- Enitre class into interest groups and decision-makers _____
- Selected students _____

PHASE III: DEVELOPING RECOMMENDATIONS TO PRESENT TO DECISION-MAKERS (Tasks I to L)

Options:
- Verbal presentation _____
- Written statement _____
- Combination of above _____
- Visual displays to accompany verbal/written statement _____

PHASE IV: DECISION-MAKING (Task M)

Options:
- Class discussion after presentation; _____
- Small groups make autonomous decision, then entire class discussion; _____
- Each interest group elects one person to form decision-making body; _____
- Selected students are decision-makers; _____
- Outside group is decision-maker. _____

PHASE V: EVALUATING THE PROCESS (Task N)

Options: Entire class _____
Small groups _____

PHASE VI: FOLLOW-UP WITH THE REAL ISSUE (Tasks O and P)

Rationale for Selecting This Option	Materials and Task Cards Needed for This Phase	Things to Do to Get Ready for This Phase and Option	After-Thoughts: Notes and comments about the organization, use of materials, student reaction, adaptations and changes or additions made in procedures or materials
PHASE I			
PHASE II			
PHASE III			
PHASE IV			
PHASE V			
PHASE VI			

Procedure for Investigating the Issue

PHASE I: LOOKING AT THE ISSUE

Objective: As a result of participation in Phase I, students will have analyzed information about an issue and summarized the facts about that issue.

Have students collect information about the issue from all the sources possible: newspaper reports and data from appropriate land management agencies, i.e., the Department of Environmental Quality, magazine articles, interviews and maps.

NOTE: *Tasks A-D give the students guidelines in formulating their own summary of the problem and its implications.*

TASK A: Describing the Issue

Describe issue – size, location, economic, social, history of use, etc.

TASK B: Collecting and Recording Information

List some factors that might affect this issue.
Decide what you want to find out about this issue.
Describe the kind of data that needs collecting.

TASK C: Interpreting the Information Collected

Describe what the collected data tells you about the issue.
List comparisons, contracts or cause and effect relationships, etc.
Extend the investigation.

TASK D: Analyzing the Impact

Describe the general interest and impact of issue.

	Other Environments	*Social Patterns*	*Economic*	*Politics*	*Other*
Local					
Regional					
National					

Options: (Select one of the following options to use with class in Phase I)

___ a. Entire class researches problem using basic data provided in written material. Students fill out Tasks A-D individually or in small groups. Class discussion about the problem.

___ b. Selected students introduce the problem through oral presentations. Students can each present one part of the problem or make presentation through the eyes of one of the interest groups affected by the issue. Students fill out Tasks A-D from the information given in the presentation and the written material provided.

___ c. Teacher introduces the issue with an oral presentation about the problem. Students fill out Tasks A-D from the information given in the presentation and the written material provided.

PHASE II: IDENTIFYING INTEREST GROUPS

Identifying Interest Groups:

Objective: As a result of participation in Phase II a student will have identified and listed individuals and/or groups who might be interested or affected by the issue, and identified questions and concerns they might have about the issue using Task E and F.

Tasks E-F: Interest Groups and Their Analysis. These tasks are for analysis to what groups should be involved in what information they will be interested in.

TASK E: Listing the Possible Interest Groups

Who	**How – Why**
Groups and individuals who are interested	
Groups and individuals who should be interested	
Groups and individuals who are affected	

TASK F: Analyzing the Interest Groups

List questions of concerns each group might have. List interest groups and individuals who might be intergsted in or affected by this issue.

Concern Questions	*Interest Groups & Individuals*				
(Sample Questions)	*Timber industry*	*Preservation group*	*Recreation sportsman's club*	*Local chamber of commerce*	*Resource management agencies*
1. How many acres of timber will be affected?	X	X	X		
2. How much board-foot volume will be lost?	X				
3. Will this get into the wilderness?		X			
4. Will this infestation affect the winter deer herd?			X	X	

Options: Select one of the following options to use with class in the above task of Phase II. (Each student fills out entire lab sheet.)

__ a. Entire class:
   1. Individually
   2. Small groups

__ b. Teacher provides list of interest groups for a starter:
   1. Students fill out list of questions and concerns
      a) Individually
      b) Small groups
   2. Divide class into small groups. Each small group should list five to six questions or concerns for just *one* of the interest groups. Each group list is compiled into a master list.

Summarizing Interest Groups' Points of View:

Objective: As a result of participation in the second section of Phase II, students will have described in writing a summary of interest groups and points of view using Task G.

Task G: Summary points of view of interest groups. One can see at a glance a summary of how the issue affects the groups involved and how each group might view it.

TASK G: Summarizing the Points of View of Interest Groups

Complete the following chart:

Interest Groups (Who They Are)	*History of Interests – Past, Present, Future*	*Concerns They Have About the Issue*	*How They Are Affected by the Problem*	*Alternatives They Might Choose and Why*

Options: Select one of the following options for the class to use in the second section of Phase II.

__ a. Entire class

__ b. Small groups could do Task G here or they could wait and use after each interest group has developed their own "group history" in depth.

Divide Into Interest Groups for Role-Playing

Objective: As a result of participating in the third part of Phase II, students will have described in writing the history of an assigned interest group using Task H and role-played their group's position in a simulation model about the issue.

Before these interest groups become too involved in the answers or solutions to the problems, they should spend time analyzing *who they are* (who they represent), determine the philosophy of the group they represent and prepare a capsule "group history."

Task H: Interest Group History. This task helps the participants identify who they are, analyze their role and determine their philosophy. Also, it helps prepare them for developing a proposal in the next phase.

TASK H: Developing the Interest Group History

Complete the following chart for the interest group you represent:

Your group represents _____

Made up of _____

Your interests are:

Past _____

Present _____

Future _____

How your group is affected by the problem or issue _____

Questions or concerns _____

Additional information _____

Options: Teacher selects one option for the class to use in last section of Phase II.

___ a. Entire class divides into interest groups (number off, draw straws, appointment by teacher, etc.).

___ b. Part of class divides into interest groups and becomes decision-makers.

___ c. Selected students act as individual representatives of interest groups, while the rest serve as decision-makers.

PHASE III: DEVELOPING RECOMMENDATIONS TO PRESENT TO DECISION-MAKERS

Objective: At the end of Phase III students will have constructed and presented a recommendation for a solution of the investigated issue to the decision-making body using Tasks I-L. Presentations should be in the form of a recommendation, proposal or plan of action as a solution to the investigated issue. The presentation should also contain a justification statement for the recommended action.

Tasks I-K: Analyzing factors, courses of action and action plans. A procedure to analyze factors and alternatives, to develop possible courses of action and to develop a plan to implement your proposed recommendations.

TASK I: Analyzing Factors and Alternatives to Present Conditions

How different factors contribute to problems of current issue.

Alternatives to present effects of change on conditions (elimination, problem or issue modification and substitution)

TASK J: Analyzing Possible Course of Action (See Appendix for entire card)

Possible Course of Action	*Advantages*	*Disadvantages*
1.		
2.		
3.		
4.		

TASK K: Developing an Action Plan that Could be Used to Implement Your Proposed Recommendations

Suggested Solution	*Type of Action*	*Identify Change Agents*	*Implementation Steps*	*Evaluation*

TASK L: Recommendations by Interest Group

We recommend _____

because _____

and _____

By _____
Interest Group

Options: Select one of the following options to use with class in Phase III for format of presentation.

___ a. Verbal presentation

___ b. Visual displays to accompany

___ c. Written statement

___ d. Combination of the above

PHASE IV: DECISION-MAKING

Objective: As a result of participation in Phase IV, the student will have constructed a list of criteria to evaluate the presentation and recommendation and will have made a decision based on that criteria using Task M.

"Decision-making" may simply involve an evaluation of each proposal, or it could mean an actual selection of one or more of the proposals as acceptable to the decision-makers.

Task M: Establishing Criteria to Evaluate Recommendations. The purpose of this task is to develop the criteria you will use in evaluating the proposals based on such items as the needs of the people, characteristics of the land, complexity of the problem and other social and economic factors. Develop some kind of matrix you can use in evaluating the presentations while they are being given.

TASK M: Establishing Criteria to Evaluate Recommendations

1. Establishing criteria to evaluate recommendations to be used by a decision-making body.
2. After hearing the presentations, rate it on the chart below.
3. Rate recommendations against criteria.

Criteria	*Recommendations by Interest Groups*			
List items needed to consider in evaluating presentations	Name of interest group			
Summary of the decision-making evaluation and report				

NOTE: *There are many ways to make a decision. Voting is only one of them.*

After each group has analyzed the factors affecting the problem, analyzed the alternatives and made a decision on a possible course of action in Task M, it would be important to actually write a letter with their recommendations for solving the issue (with their justifying statements and data) to the appropriate group responsible (see Task A).

Options: Select one of the following options to use with the class in Phase IV.

__ a. No decision-makers. After the presentations, the entire class evaluates and discusses the proposals. (Analyze the consequences of each of the alternatives.)

__ b. Entire class is divided into small groups. Each new group should consist of one member from each interest group. The new groups will each act as an autonomous decision-making body.

__ c. Appoint, select or elect one person from each interest group to be a decision-making body.

__ d. Selected students (by chance or appointment) are designated as the decision-making body early in the game and do not become involved in an interest group.

__ e. Outside groups come in, hear the presentations and become the decision-making body. These groups could be: 1) another class studying the problem, 2) another class not studying the problem, or 3) a group of students from different classes.

PHASE V: EVALUATING THE PROCESS

Objective: As a result of participating in Phase V, the student will have described in writing his ideas about the processes in which he was involved using Task N.

Task N: Evaluating the process. Using the questions as a starting point for discussion may help emphasize the value of involvement in current issues for reasons other than the accumulation of information.

TASK N: Evaluating the Process

Respond to the following questions:

1. Group interaction and individual participation:

   a. How did you feel about your participation as an individual?
   b. What were some factors that helped people to work together in a group?
   c. What things were done to encourage participation by everyone?
   d. Did new leadership emerge during these activities? What factors enabled this to happen?
   e. How did you feel playing a role with which you were only slightly familiar?

2. Content and procedures:

   a. In what ways was the decision-making process similar to real decision-making processes in your life? (in your school and in your community)
   b. What techniques were used to convince, persuade or sell an idea?
   c. What additional information would you like to have had in order to prepare a better presentation or to gain more understanding about the issue?

Options: Select one of the following options for the class to use in Phase V.

___ a. Entire class discussion

___ b. Small group discussions

___ c. A written evaluation

___ d. Any combination of the above

PHASE VI: FOLLOW-UP WITH THE REAL ISSUE (AS IT HAPPENS OR AFTER IT HAPPENS)

Objective: As a result of participating in Phase VI, the student will have constructed a matrix of at least six different information sources and made a comparison between the study of the real issue using Tasks O and P.

Phase VI is an important part of this activity. Following the real issue in the newspapers, television, actual observations, interviews, reports, etc., will allow the participants to compare their discussions and decisions with those responsible for the management of the land or the particular issue being studied.

It allows the participants to compare their data collecting techniques and processes with those in the appropriate professions concerned with the issue and can provide the opportunity for participants to write for additional information about the actual decision.

Task O: Information Analysis. Task O provides an opportunity to analyze a variety of information from different sources. Comparisons can be made between the points of view of different groups with your analysis of those groups in Phase II.

TASK O: Analyzing Information Sources

Examine sources of information about the real issue.

Media (newspaper, television, interview report, etc.)	*Source of Information (who put it out — agency, individual, organization)*	*Title*	*Date*	*Purpose of Publication or Other Information*	*Points of View Expressed*

Task P: Comparing the Results. Task P provides an opportunity to compare the results of your study of the issue with the results of the actual issue as it develops (or after it happens).

TASK P: Comparing the Results

Compare your study of the issue and situation with the actual issue as it develops.

Interest groups

Point of view

Decision-making

Implication of the decision

Appendix

Task Formats

TASK A: Describing the Issue

Title of Issue: _____

Description of Issue:

What is happening?
Where is it happening?
Why is it happening?
(Past history and events, etc.)
Who is affected?
How are they affected?
What is the economic, aesthetic, social and political impact of the issue?
What are the possible courses of action about the issue?
Is there an environmental impact statement required and available? Where?

Name and address of agency/organization with major responsibility for final decision and management:

TASK B: Collecting and Recording Information

List some factors that might contribute to the issue.

Describe what you want to find out about this issue and/or its factors.

Describe the kind of data that needs to be collected.

Information sources about this resource or activity (people, places, reports, etc.).

1.
2.
3.

Based on the information we have read and discussed, our group would like to find out more about:

1.
2.
3.

The questions we will ask to find out these things are:

1.
2.
3.

In order to find out more about these things, we will make specific observations about:

1.
2.
3.

We will use the following data recording procedures:

1.
2.
3.

TASK C: Interpreting the Information Collected

Management Analysis Matrix

Management practices used for this resource or activity	*Why*	*Factors to Consider in Managing the Commodity*		
		Special characteristics of the land or resource (suitabilities) (limitations) (constraints)	*Economic considerations*	*Effect of current management practices on the total environment*

Describe what the collected data tells you about the issue.

List comparisons, contrasts and cause and effect relationships that can be inferred from the collected data.

What big ideas are suggested by the interpretation of this data?

What implications do these big ideas have to environmental management?

Extending the Investigation

List parts of the investigation that can be explored more fully by further data collecting.

Describe further data that needs to be collected. (Where? How often? What time of year?)

Describe what might be significant about collecting the additional information.

TASK D: Analyzing the Impact

Based on the data you have collected so far, describe the general interest and impact, as you see it, that this issue can have in the following areas.

Area	*Other Environments*	*Social Patterns*	*Economics*	*Politics*	*Other*
Locally (county, city) Interest Impact					
Regionally (state or states)					
Interest Impact					
Nationally Interest Impact					

From the chart above, observations and analysis of information concerning the issue, construct a brief statement which would summarize the general impact of this resource or activity.

TASK E: Listing the Possible Interest Groups

It is important to identify the groups and individuals who have a right to be involved in investigating, reporting and solving the issue. List key groups or individuals in the categories below.

Who	*How or Why*
Those groups or individuals that are interested in the issue.	
Those groups or individuals that should be interested in the issue.	
Those groups or individuals that are affected in the issue. (May include some from above.)	

After Task E, go on to Task F, Analyzing the Interest Groups

TASK F: Analyzing the Interest Groups

List questions or concerns each group might have. List interest groups and individuals who might be interested in (or affected by) this issue. (From Dr. Mike Giammatteo)

	Interest Groups and Individuals								
Concern Questions									
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									
11.									

TASK G: Summarizing the Points of View of Interest Groups

Analyzing the information in Task H and other information you can gather about the interest groups, complete the following chart:

Interest Groups (who they are)	*History of Interests – Past, Present, Future*
Concerns they have about the issue	
How they are affected by the problem	
Alternatives they might choose and why	

TASK H: Developing the Interest Group History

Complete the following chart for the group you represent.

Your Group Represents	*Questions or Concerns*
Interests Past – Historically, your group has (been interested in) (supported) Present – At the present time your group is (involved in) Future – Trends indicate that the future of your group	
How your group is affected by the problem	
Additional information from data supplied	

TASK I: Analyzing Factors and Alternatives to Present Conditions

Task I is designed to brainstorm all possible alternatives. List the factors contributing to the issue. Take each factor and ask: "How can we change this factor (eliminate, modify, substitute) to bring about a change in the issue?" Consider all alternatives, no matter how silly they may seem.

Example: Traffic Management

Factor	*How It Contributes to the Problem or Issue*	*Alternatives to Its Present Condition*	*Describe How the Change Will Effect the Problem or Issue*
Width of streets	Causes traffic jams	Elimination: Put in walking or bicycle paths	Eliminate car traffic, cause changes in working-social patterns
		Modification: One-way streets	Ease congestion because of one-way flow
		Substitution: Mass transit	Minimize number of vehicles, no congestion, less air pollution, etc.
Standard work hours	Cause traffic jams	Modification: Adjust starting, closing, working hours	Spread out traffic over a longer period of time
			Eliminate car traffic, cause changes in working-social patterns

TASK J: Analyzing Possible Courses of Action

Develop a list of possible courses of action from Task I and all the other information and data you have collected. List below and analyze advantages and disadvantages of each.

Possible Courses of Action	*Advantages*	*Disadvantages*

Based on the interests, needs and history of your assigned group, select one or more courses of action that your interest group might support. Before deciding on your final recommendations, your group should analyze these courses of action using the chart in Task K.

TASK K: Developing an Action Plan That Could Be Used to Implement Your Proposed Recommendations

Select one of the solutions or recommendations or courses of action suggested by your group. Write it below under "Suggested Solution." Complete the rest of the chart. This task can help you determine if your solution is feasible or not, and what course of action you plan to take for its implementation.

Suggested Solution (or recommendation or course of action)	*Type Action Necessary to Implement Your Idea*	*Identify Change Agents Who Could Help Implement Your Idea*	*Implementation Steps*	*Evaluation Methods – How Will You Follow Up and Evaluate the Effectiveness of Your Actions?*
Write in solution suggested by your group in Task J.	*Technological* What kinds of technological action would be necessary to implement this idea?	*Individual* What kinds of things could be done through individual action?	What must be done? – in what order? – when?	
	Social What kinds of social action would be necessary to implement this idea?	*Groups* What kinds of things could be done by/ through groups? (informal and formal organizations)	*Steps*	
	Political What kinds of political action would be necessary to implement this idea?	*Agencies* What kinds of things could be done by/ through agencies?	*Target Date*	

When you finish Task K, then go on to Task L.

TASK L: Making Recommendations by Interest Groups

We recommend (this action about the issue) _____

because (of these facts) _____

(and these opinions from our group) _____

The following steps would be necessary to implement our recommendation _____

By _____
Interest Group

TASK M: Establishing Criteria to Evaluate Recommendations

To be used by decision-making body. After hearing the presentation, rate the recommendations on the chart below and rate them against criteria.

NOTE: *There are many ways to make a decision. Voting is only one of them.*

Criteria (List items needed to consider in evaluating presentations)	*Recommendations by Interest Groups*
	Name of Interest Group

Summary of the decision-makers' evaluation and report:

TASK N: Evaluating the Process

Respond to the following questions:

1. *Group interaction and individual participation*:

   a. How did you feel about your participation as an individual?
   b. What were some factors that helped people to work together in a group?
   c. What things were done to encourage participation by everyone?
   d. Did new leadership emerge during these activities? What factors enabled this to happen?
   e. How did you feel playing a role with which you were only slightly familiar?

2. *Content and procedures*:

   a. In what ways was the decision-making process similar to real decision-making processes in your life? (in our school, in our community)?
   b. What techniques were used to convince, persuade or sell an idea?
   c. What additional information would you like to have had in order to prepare a better presentation or to gain more understanding about the issue?

TASK O: Analyzing Information Sources

Examine sources of information about the real issue.

Media, (newspaper, television, interview report, etc.)	*Source of Information (who put it out – agency, individual, organization)*	*Title*	*Date*	*Purpose of Publication or Other Information*	*Points of View Expressed*

TASK P: Comparing Results

Compare your study of the issue with the actual issue (as it develops or after it happened).

Interest Groups

Were the interest groups you identified in your study the same as those actually involved?

Which interest groups were most vocal in your study? In the real issue?

Which questions on your list (Task Card B) were actually asked in the real issue? What additional questions were asked in the real issue?

Points of View

Compare your summary of points of view (Task Card G) with the points of view expressed during the real issue.

Did any of the groups in the real issue change their original position as the issue developed? What reasons could account for this?

Was there dissent within the various groups during the issue and following the final decision? What was the nature of this dissent?

What new facts and figures were brought out during the real issue?

Decision-Making

Compare the decision-making process in your simulation (if this was a part of your study) to the actual decision-making process. Who were the decision-makers in each? What factors had the most influence on the decision in each?

What did each group "win" and "lose" in the real issue?

What compromises were made?

Implications of the Decision

What provisions are going to be made for follow-up studies of the proposed action?

What future issues or situations might have components similar to this issue?

In general, what are the political, economic, scientific and environmental implications of the final decision?

Resource List

When requesting information from the following sources, be specific. Identify the type of information and, if possible, provide a brief description of how the information will be used. The description will allow your resource the opportunity to include additional information that is not already available with general requests. Along with the addresses and titles of organizations, you will find a brief description or listing of the types of information available.

1. Indiana Department of Public Instruction Room 227 State House Indianapolis, Ind. 46204	*Total Environmental Education Guide*
2. Indiana State Board of Health Division of Health Education 1330 West Michigan Street Indianapolis, Ind. 46206	*Whole Earth Design* Environmental Film Library (list available) Literature on Environmental Health
3. Department of Natural Resources Public Information Room 608 State Office Building Indianapolis, Ind. 46204	Conservation Education Material Conservation Film Library
4. Soil Conservation Service U.S. Department of Agriculture Suite 2200, Atkinson Square, West 5610 Crawfordsville Road Indianapolis, Ind. 46224	Brochures Curriculum Guide for Conservation Education *Outdoor Classrooms on School Sites* *Teaching Soil and Water Conservation — A Classroom and Field Guide* *An Outline for Teaching Conservation in Elementary Schools*
5. Indiana Cooperative Extension Service Agriculture Administration Building Purdue University West Lafayette, Ind. 47907	Agriculture information can be ordered through the county office.
6. County Health Department	Addresses can be obtained through your local phone directories. Your local Health Department has total access to the State Board of Health information program as well as more detailed information on your local area.
7. Indiana Lung Association 30 East Georgia Street Indianapolis, Ind. 46204	Information on lung diseases and air pollution problems is available from their public information department.
8. Environmental Protection Agency, Region V One North Wacker Drive Chicago, Ill. 60606	General information on environmental problems is available to the public in addition to specific environmental education and activity programs for the school.

9. American Camping Association
Bradford Woods
State Road 67
Martinsville, Ind. 46151

Catalog of publications and camping publications is available.

10. U.S. Forest Service
1617 J Street
Bedford, Ind. 47421

Environmental materials are available.

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